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Assessment of Needed Publicly Owned Wastewater Treatment Facilities in the United States

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Washington, DC

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The 1984 Needs Survey Report summarizes a 2-year data collection effort. This Report includes costs for building grant eligible municipally-owned treatment facilities for the current (1984) population when all identified year 2000 needs are met. The Report also contains national summaries of technical information collected during the Survey. Examples of the technical information are: number of treatment plants now and in year 2000; number of nondischarging treatment plants; summary of treatment plant unit processes.

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1984 Needs Survey
Report to Congress

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February 10, 1985

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Introduction

This report summarizes the Environmental Protection Agency's 1984 assessment of needed publicly owned wastewater treatment facilities in the United States. This biennial report is required by sections 205(a) and 516(b)(1) of the Clean Water Act. The 1984 Needs Survey, a joint effort of EPA and the States, is the seventh needs assessment since enactment of the Federal Water Pollution Control Act Amendments of 1972.

The Needs Survey assesses the capital investment required to meet the needs of our current 1984 population (referred to as "backlog" needs in previous Needs Surveys), as well as the additional amount needed for population growth through the year 2000. The needs presented in this report include those eligible for Federal financial assistance under the Clean Water Act, reflecting the section 204(a)(5) reserve capacity limitations. However, since State programs are not limited by Federal eligibility requirements, the full year 2000 needs, unrestricted by the reserve capacity limitations, have also been included. For the purposes of this report we will refer to the year 2000 needs eligible for Federal financial assistance as "eligible year 2000 needs" and the full year 2000 needs, unrestricted by the reserve capacity limitations, as "total year 2000 needs." All other items considered ineligible for Federal financial assistance under the Clean Water Act were eliminated from this assessment.

In the 1981 Construction Grant Amendments, Congress added a new dimension to the Needs Survey by directing EPA to "address water quality needs adequately and appropriately." While the 1982 Needs Survey was too far along to respond directly to this requirement, the foundations were laid for conducting a comprehensive water quality needs assessment in the 1984 Survey. This report examines the potential, aggregate impacts of the needed municipal facilities on future water quality.

In addition to presenting capital cost estimates and assessing the water quality implications of constructing needed facilities, the 1984 Survey has sought to improve the quality of the survey data, to evaluate the reliability of the cost estimates, and to assess the impact of the 1981 Construction Grant Amendments on the potential amount of future Federal investment in these municipal facilities. These goals expand on those of previous Needs Surveys, which concentrated mainly on estimating capital costs for needed facilities. The 1984 Needs Survey responds directly to the Clean Water Act's intent of focusing the construction grants program on improving water quality.

What is the Bottom Line?

A capital investment of $40.6 billion is needed to construct necessary primary, secondary, and advanced treatment plants; correct infiltration/ inflow; and construct new interceptor sewers for the current 1984 population. An additional $12.5 billion will be required in these areas to address the population growth expected between 1984 and 2000 (eligible year 2000 needs). These costs are for those portions of the municipal facilities that are fully eligible for Federal financial assistance under the Clean Water Act. Ineligible reserve capacity beyond October 1, 1990, has been eliminated from these estimates. An additional $7.2 billion is necessary beyond the reserve capacity limitations to address total population growth through the year 2000 (total year 2000 needs).

Three other categories of municipal pollution projects are included in this report: replacement and rehabilitation of existing sewers, construction of new collector sewers, and correction of combined sewer overflows (CSOs). The total need for the current 1984 population in these three categories is $44.4 billion. An additional $4.2 billion will be required for collector sewers to meet the demands of increased population through the year 2000. While the Clean Water Act makes these categories generally ineligible, Federal financial assistance can be given to any individual facility at the discretion of a State Governor, up to a limit of 20 percent of the State's allotment. Moreover, the Act includes special funding provisions for CSOs in section 201(n). Therefore, these needs are of clear concern to the States and municipalities, as well as to EPA, and are thus presented in this report. These categories of need are not affected by the reserve capacity limitations of the Act; the eligible and total year 2000 needs are identical.

Unlike previous surveys, this report does not include cost estimates for treating or controlling pollution from separate storm sewers, which are not eligible for Federal grants. Because available data and analytical techniques have changed very little in the past two years, the 1982 Needs Survey estimates for treatment or control of stormwater best approximate this type of need. The 1982 estimate for the nation was $93 billion.

Meeting all eligible needs identified in this report would result in a potential future Federal investment of approximately $35.8 billion (1984 dollars). This projection is based on the provisions of the Clean Water Act relating to Federal grant share, reserve capacity eligibility, grandfathered phased and segmented projects, eligible funding categories, and the discretion of Governors to fund projects in otherwise ineligible categories.

In addition to the cost estimates, this report examines the potential impacts of needed municipal facilities on future water quality. Focusing on changes in conventional municipal pollutants, our analysis reaffirms the strong gains that have been made since enactment of the Federal Water Pollution Control Act Amendments of 1972, and predicts similar gains when the municipal wastewater needs of the current population are satisfied.

Of course, as population increases toward the end of the century, State and local governments will have to continue implementing their responsibility for construction of needed capacity, so that water quality progress already made will continue. In fact, even though increased population will add substantial new flows to the nation's waters, future water quality would be no worse than it is today when State and local governments construct the needed facilities. Only if the State and local governments do not implement needed new capacity would future water quality be worse than existing conditions.

The report does not attempt to predict absolute water quality at any point in time, since we have not accounted for changes in the levels of nonmunicipal pollution, such as industrial or nonpoint sources. In addition, we do not know the timing or extent to which these needs will actually be met. Final facility plans for many communities may well call for advanced or nondischarging treatment processes that could result in additional water quality improvements. This report assesses only the relative, aggregate impacts of fully meeting the current 1984 needs identified in the Needs Survey, whenever that may occur.

These cost estimates and their potential water quality impacts are the bottom line, but they are by no means the total picture. Subsequent sections of this report will put these estimates into perspective by explaining how they were developed, examining their level of reliability, calculating the potential future Federal investment, and investigating the relationship between needs and water quality improvements.

The 1984 Needs Survey

Major Objectives

The major objectives of this report are three-fold: to update the facility cost estimates of the 1982 Needs Survey, to calculate the potential future Federal investment if all needs are met, and to assess the possible water quality impacts of meeting those needs.

The first objective, to update the facility cost estimates, started with the 1982 Needs Survey projections. Changes were made to account both for inflation and for the planning and construction activities of individual facilities during the past 2 years. This included grant awards, new facility plans, advanced treatment reviews, and ocean discharge waivers. In addition, we actively sought documentation for all needs not based on detailed facility plans, and developed a means of assessing the levels of reliability of the individual facility cost estimates.

Because of the significant changes in Federal participation in construction grants after October 1, 1984, the second objective is to estimate the potential future Federal investment if all identified needs are satisfied. This includes assessing the impacts of major provisions of the 1981 Construction Grant Amendments affecting any future Federal investment: eligible categories of need, reserve capacity, Federal grant share, grandfathering of phased or segmented facilities, and the various funding reserves.

The third, and newest, objective is to assess the potential impact of needed municipal wastewater treatment facilities on the receiving waters. We have evaluated the relationship between meeting identified needs and overall water quality. In addition, we have presented a hydrologic perspective of traditional Needs Survey information, such as how needs are distributed by river basin and which basins have already received grant funding.

What is a "Need"?

A "need" is a cost estimate for building publicly owned wastewater treatment facilities eligible for Federal financial assistance under the Clean Water Act. Needs are estimated for facilities used in the conveyance, storage, treatment, recycling, and reclamation of municipal sewage wastes. Estimates are included for all types of needed changes to wastewater facilities, including constructing entirely new facilities as well as enlarging, upgrading, abandoning, and replacing existing facilities. Existing facilities are considered for replacement when they have reached the end of their design life and are obsolete. Other types of changes to existing facilities are projected as a response to the statutory requirements of the Clean Water Act. These estimates do not include costs for operation and maintenance.

The total need for a facility has been divided into the following cost categories:

- o Category I - Secondary Treatment
- o Category II - Advanced Treatment
- o Category IIIA - Infiltration/Inflow Correction
- o Category IIIB - Major Sewer Rehabilitation
- o Category IVA - New Collector Sewers
- o Category IVB - New Interceptor Sewers
- o Category V - Combined Sewer Overflows

These categories relate to the various types of municipal wastewater construction projects. Expanded explanations of each category can be found in the Glossary.

What Types of Data Were Collected?

The 1984 Needs Survey contains the following three types of data:

- o Cost data. Working through the State agencies, EPA obtained estimates of the needed future capital investment for each individual municipal wastewater treatment facility. The cost estimates are for those portions of a facility eligible for Federal financial assistance under the Clean Water Act. Cost estimates were obtained from detailed planning documents whenever possible. It must be noted, however, that in many cases these facility plans were as much as 6 to 8 years old, reflecting the surge in facility planning that took place following the enactment of the 1972 Amendments. Facility planning cost estimates are not generally updated for the purposes of the Needs Survey except to account for the effects of inflation. If detailed planning documents were not available, but a need was identified by a State, estimates were developed using generalized cost-estimating procedures.

  The estimates are separated into the costs needed for the current 1984 and the expanded year 2000 populations. The incremental year 2000 cost estimates were then modified by EPA to reflect the section 204(a)(5) reserve capacity limitations of the Act. The estimates for 1984 are based on population projections developed by the Census Bureau in July 1982; the year 2000 estimates are based on population projections developed by the Department of Commerce.

- Facility data. In addition to cost data, we collected various types of technical information for each facility. Of interest were the operational status of the facility, the population of the service area, the existing or planned treatment process, anticipated changes or additions to the treatment process, current and projected effluent quality, and required sewer system expansions or improvements.

- Hydrologic data. The cost and facility data were also linked to various hydrologic data for national analysis and basinwide water quality simulation. Stream system data include hydrologic flow paths, mean and low flows, and stream segment length, slope, and latitude/longitude. Pollution data for point sources include the receiving stream, current and planned municipal effluent characteristics and flows, and standardized industrial effluent data. Also included are the State-designated uses and the ammonia and dissolved oxygen criteria that apply to each stream. The data were grouped by the 21 U.S. Geological Survey regional hydrologic units (Figure 1). For the 1984 Needs Survey, these units have been divided into 314 subbasins, many of which cross State lines.

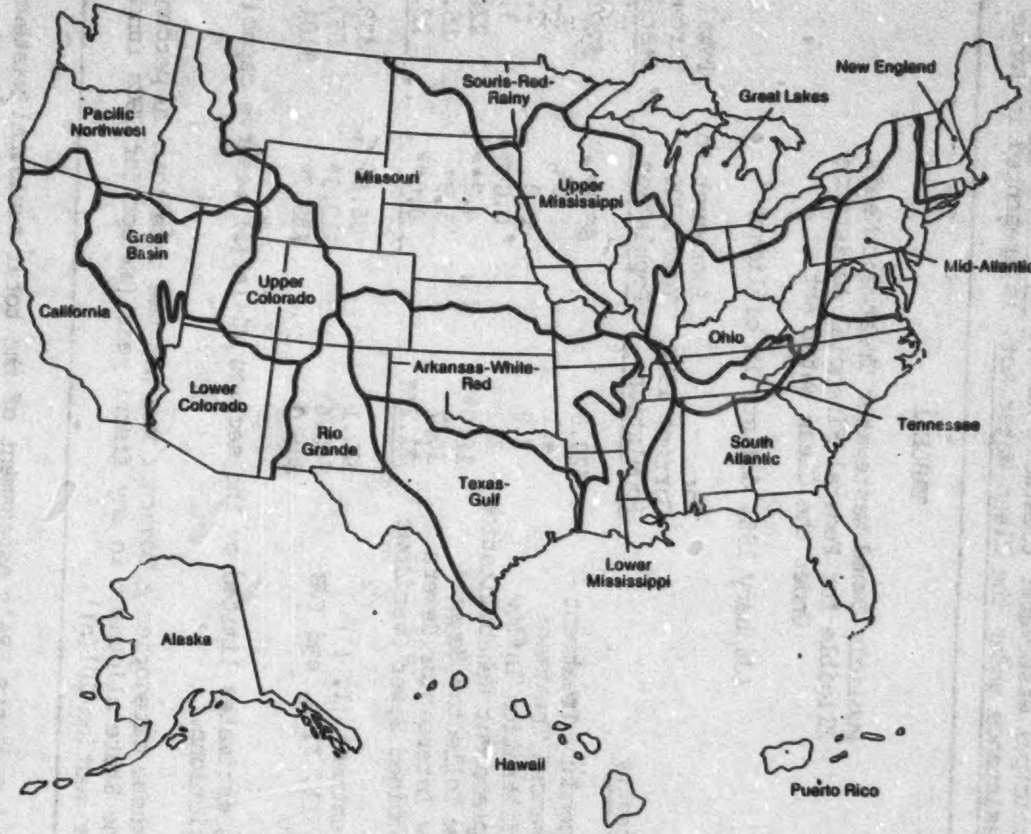

Pacific Northwest
California
Great Basin
Upper Colorado
Lower Colorado
Rio Grande
Missouri
Souris-Red-Rainy
Upper Mississippi
Arkansas-White-Red
Texas-Gulf
Lower Mississippi
Great Lakes
New England
Mid-Atlantic
Ohio
Tennessee
South Atlantic
Alaska
Hawaii
Puerto Rico

FIGURE 1 UNITED STATES GEOLOGICAL SURVEY HYDROLOGIC REGIONS

What are the Needs?

The capital investment necessary to address current 1984 and future year 2000 municipal wastewater treatment needs, eligible for Federal financial assistance under the Clean Water Act, is presented in Table 1.

TABLE 1

Publicly Owned Wastewater Treatment Needs
Eligible for Federal Financial Assistance
Under the Clean Water Act

(January 1984 dollars in billions)

Needs Category	For Current 1984 Population	Increment for Year 2000 Population	Total through Year 2000
I Secondary Treatment	$23.0	$5.6*	$28.6*
II Advanced Treatment	4.1	1.0*	5.1*
IIIA Infiltration/Inflow	2.8	0.0	2.8
IIIB Replacement/Rehabilitation	3.2**	0.0**	3.2**
IVA New Collector Sewers	18.0**	4.2**	22.2**
IVB New Interceptor Sewers	10.7	5.9*	16.6*
V Combined Sewer Overflows	23.2**	0.0**	23.2**
Total Treatment (I, II)	$27.1	$6.6*	$33.7*
Total I, II, IIIA, and IVB	$40.6	$12.5*	$53.1*
Total I-V	$85.0	$16.7*	$101.7*

* Needs estimates limited by the section 204(a)(5) reserve capacity restrictions.

** For these categories a Governor may not use more than 20 percent of the State allotment in any fiscal year (except for CSOs funded under section 201(n)).

Table 1 presents EPA's assessment of the total municipal wastewater treatment needs eligible for Federal financial assistance under the Clean Water Act. Ineligible needs, such as house connections to sewers, certain land acquisition costs not a part of a treatment process, and reserve capacity beyond the limitations of the 1981 Construction Grant Amendments, are not included. Costs for Categories IIIB (Replacement/Rehabilitation), IVA (New Collector Sewers), and V (Combined Sewer Overflows) are included because any individual facility in these categories can receive Federal financial assistance through the Governor's discretion to use up to 20 percent of his allotment in any fiscal year for these categories of projects. In addition, upon request of a Governor, EPA may authorize funds from the State allotment to be used for combined sewer overflow control where correction of such discharges is a major priority of the State. Since there is no way of knowing which facilities will be funded, or how much of the 20 percent will be used in any State, the entire need is reported in the survey. Also, since combined sewers are no longer built, we do not estimate combined sewer overflow needs for future populations.

Since our assumptions on limiting reserve capacity have been established on a gross basis, the results are not meaningful for individual projects, and may, in fact, be overstating the eligible need for any facility that is funded before October 1, 1990. The eligible reserve capacity of an individual facility can only be determined when the exact date of grant award is known. However, the national and State totals do give a good indication of the overall impact of the reserve capacity limitations.

Reserve Capacity Limitations

Section 204(a)(5) of the Clean Water Act states that beginning October 1, 1984, no grant shall be made to construct that portion of a treatment works providing reserve capacity in excess of existing needs on the date of approval of a grant. In no event shall the reserve capacity be in excess of needs existing on October 1, 1990. In cases where an applicant proposes to provide reserve capacity greater than that eligible for Federal financial assistance, the incremental costs of the additional reserve capacity shall be paid by the applicant. However, if EPA awarded a grant for a Step 3 interceptor segment before December 29, 1981, grants for the remaining interceptor segments included in the facilities plan may include the full planned reserve capacity, up to 40 years. For primary, secondary, or advanced treatment facilities and their interceptors that had Step 3 segments awarded before October 1, 1984, any remaining segments may include 20-years reserve capacity.

To avoid overstating the estimate of eligible needs in Table 1, we have reduced the total year 2000 needs submitted by the States, which contained no restrictions on reserve capacity, to approximate the impact of the eligible capacity limitations of the Amendments. We limited the size of each facility not affected by the grandfathering provisions of the Act to its projected 1990 capacity, resulting in a $7.2 billion reduction in the year 2000 need. Without the reserve capacity limitations, the estimated needs would be as shown in Table 2.

TABLE 2

Publicly Owned Wastewater Treatment Needs Unrestricted by the Reserve Capacity Limitations of the Clean Water Act

(January 1984 dollars in billions)

Needs Category		For Current 1984 Population	Increment for Year 2000 Population	Total through Year 2000
I	Secondary Treatment	$23.0	$9.6*	$32.6*
II	Advanced Treatment	4.1	1.5*	5.6*
IIIA	Infiltration/Inflow	2.8	0.0	2.8
IIIB	Replacement/Rehabilitation	3.2**	0.0**	3.2**
IVA	New Collector Sewers	18.0**	4.2**	22.2**
IVB	New Interceptor Sewers	10.7	8.6*	19.3*
V	Combined Sewer Overflows	23.2**	0.0**	23.2**
Total	Treatment (I, II)	$27.1	$11.1*	$38.2*
Total	I, II, IIIA, and IVB	$40.6	$19.7*	$60.3*
Total	I-V	$85.0	$23.9*	$108.9*

* Needs estimates not limited by the section 204(a)(5) reserve capacity restrictions.

** For these categories a Governor may not use more than 20 percent of the State allotment in any fiscal year (except for CSOs funded under section 201(n)).

Separate State Estimates

During the survey, all cost estimates and supporting documentation were reviewed by the EPA Needs Survey contractor. Occasionally there were disagreements over acceptable cost estimates. Whenever a disagreement could not be resolved, the State had the option of submitting a separate State estimate.

During the 1984 Survey, more than 95,000 individual cost estimates were reviewed. Out of this number there were only 57 cases, in California and Puerto Rico, in which disagreements could not be resolved and separate State estimates were submitted. If these estimates were added to the EPA assessment, the current 1984 need would increase by $1,028 million and the total year 2000 need by $973 million. Details on the dollar differences by category are presented in Table 3.

TABLE 3

Separate State Estimates

(January 1984 dollars in millions)

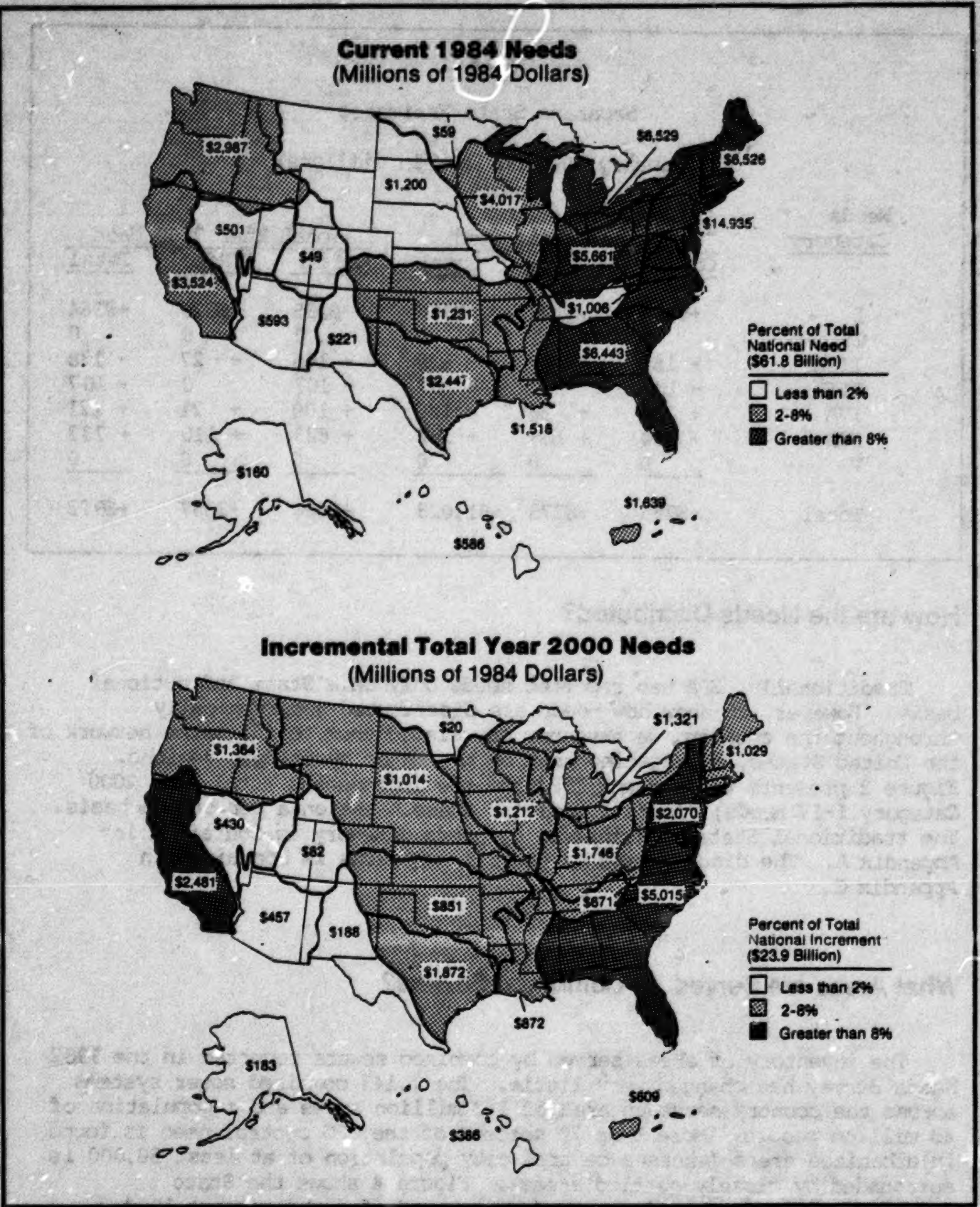
Needs Category	Current 1984 Need			Total Year 2000 Need		
	Calif.	P.Rico	Total	Calif.	P.Rico	Total
I	+$253	+$103	+$356	+$235	+$129	+$364
II	0	- 1	- 1	0	0	0
IIIA	- 165	+ 27	- 138	- 165	+ 27	- 138
IIIB	- 107	0	- 107	- 107	0	- 107
IVA	+ 100	+ 36	+ 136	+ 100	+ 21	+ 121
IVB	+ 674	+ 108	+ 782	+ 623	+ 110	+ 733
V	0	0	0	0	0	0
Total	+$755	+$273	+$1,028	+$686	+$287	+$973

How are the Needs Distributed?

Traditionally, EPA has reported needs only on a State and national basis. However, to show how needs are distributed geographically throughout the country, we have now correlated them to the water network of the United States, aggregating them by the major hydrologic regions. Figure 2 presents the current 1984 and the incremental total year 2000 Category I-IV needs; Figure 3 presents these needs on a per capita basis. The traditional State distribution by needs category is contained in Appendix A. The distribution by the 314 subbasins is contained in Appendix C.

What Areas are Served by Combined Sewers?

The inventory of areas served by combined sewers reported in the 1982 Needs Survey has changed very little. The 1,143 combined sewer systems across the country serve an area of 3.2 million acres and a population of 43 million people. More than 73 percent of the CSO control need is found in urbanized areas (where a central city population of at least 50,000 is surrounded by closely-settled areas). Figure 4 shows the State distribution of projected combined sewer needs for the current 1984 population. Tables in Appendix A present the 1984 CSO needs estimates by State; tables in Appendix C show the distribution of CSO needs by basis of estimate (generic stream use objective) and receiving water type. Appendix C also contains tables on the number of CSO facilities, CSO area, and CSO population by State.



Current 1984 Needs
(Millions of 1984 Dollars)

$2,987
$59
$8,529
$6,526
$1,200
$4,017
$14,935
$501
$49
$5,661
$3,524
$1,231
$1,006
$593
$221
$6,443
$2,447
$1,518
$160
$1,639
$586
Percent of Total National Need ($61.8 Billion)
☐ Less than 2%
▨ 2-8%
■ Greater than 8%

Incremental Total Year 2000 Needs
(Millions of 1984 Dollars)

$20
$1,321
$1,364
$1,029
$1,014
$1,212
$2,070
$430
$82
$1,746
$2,481
$851
$671
$5,015
$457
$188
$1,872
$872
$183
$609
$386
Percent of Total National Increment ($23.9 Billion)
☐ Less than 2%
▨ 2-8%
■ Greater than 8%

FIGURE 2 TREATMENT AND CONVEYANCE NEEDS (CATEGORIES I-IV) BY HYDROLOGIC REGION

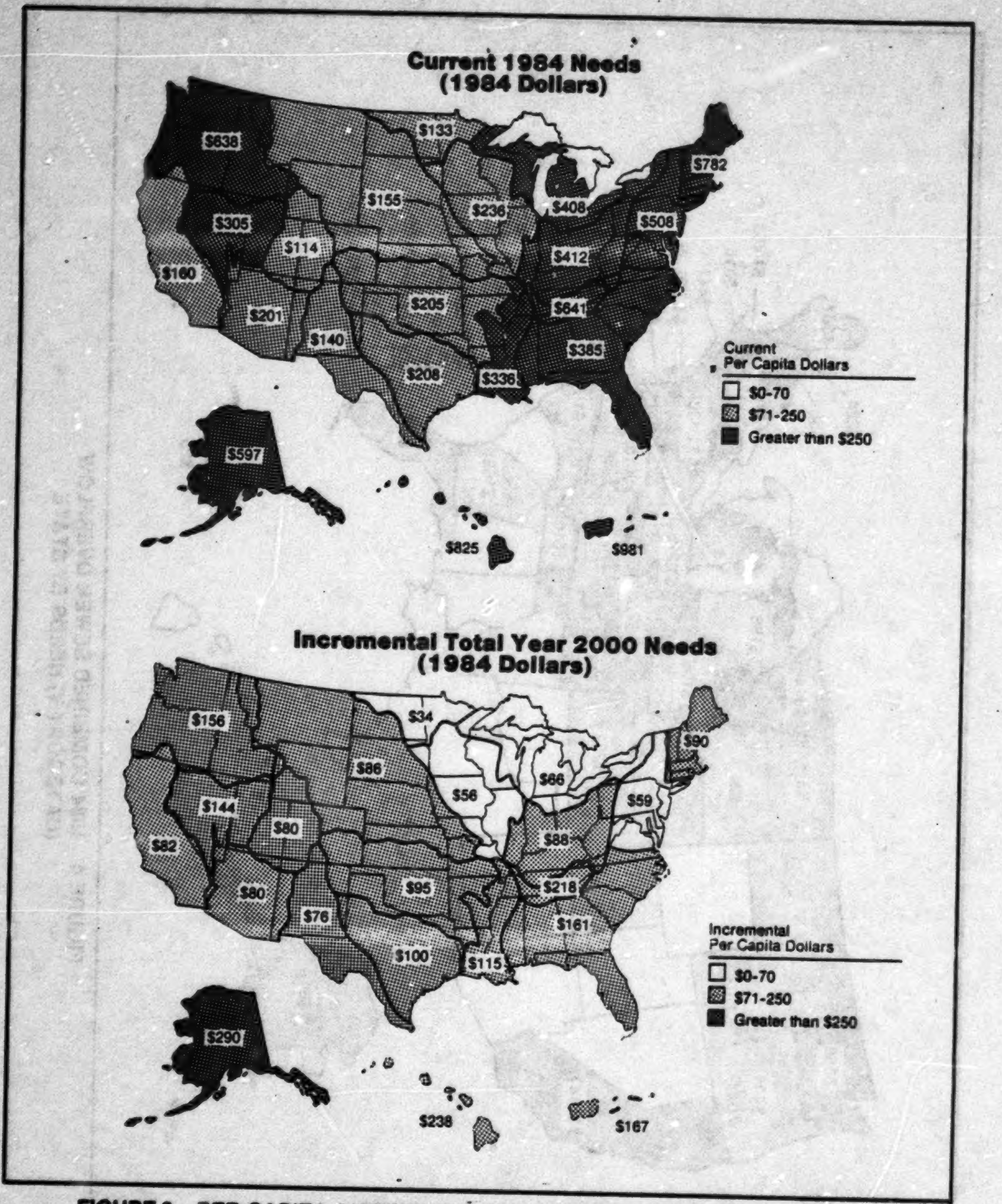

Current 1984 Needs
(1984 Dollars)
$638
$133
$782
$155
$236
$408
$508
$305
$114
$412
$160
$205
$641
$201
$140
$385
$208
$336
$597
$825
$981
Current
Per Capita Dollars
☐ $0-70
▨ $71-250
■ Greater than $250
Incremental Total Year 2000 Needs
(1984 Dollars)
$156
$34
$90
$86
$66
$56
$59
$144
$80
$88
$82
$95
$218
$80
$76
$161
$100
$115
$290
$238
$167
Incremental
Per Capita Dollars
☐ $0-70
▨ $71-250
■ Greater than $250

FIGURE 3 PER CAPITA DISTRIBUTION OF TREATMENT AND CONVEYANCE NEEDS (CATEGORIES I-IV) BY HYDROLOGIC REGION

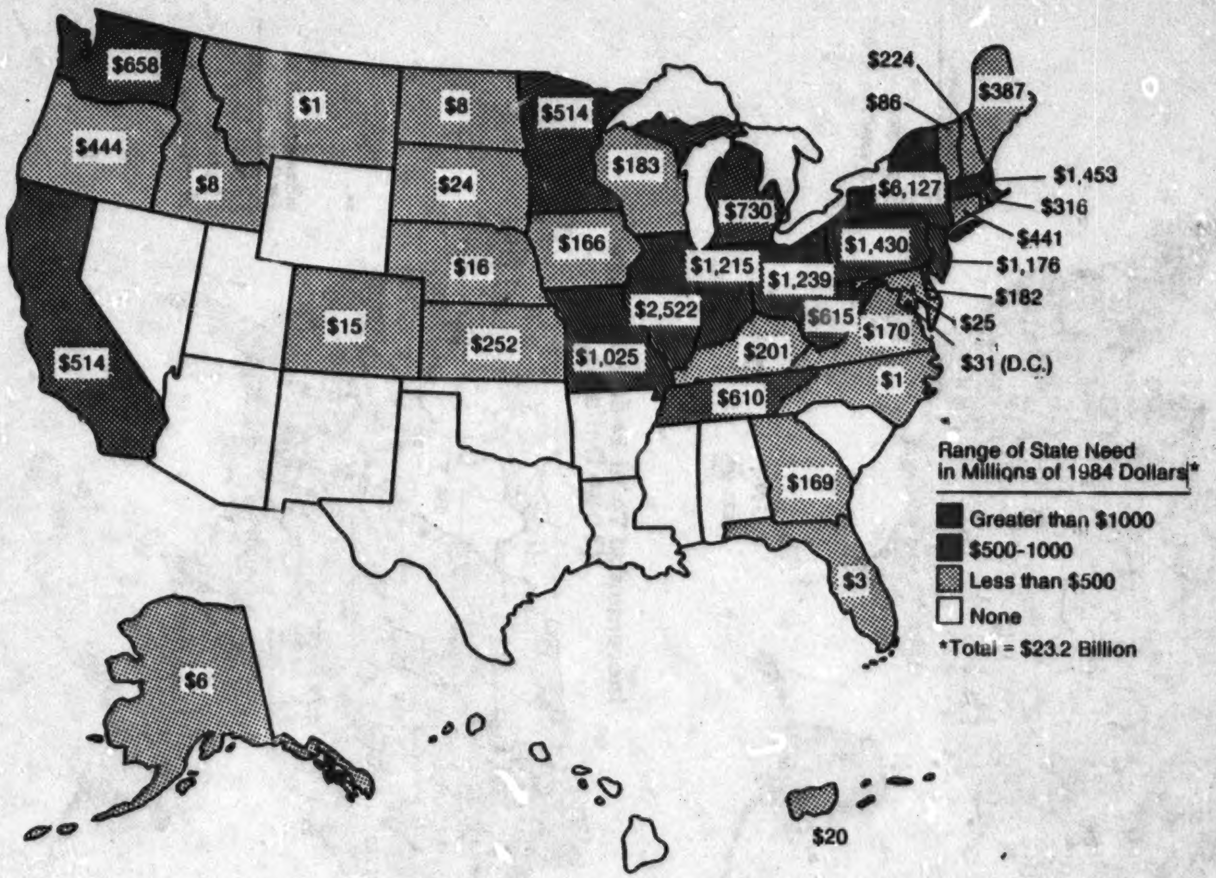

$658
$444
$514
$8
$1
$15
$8
$24
$16
$252
$514
$183
$166
$1,025
$2,522
$730
$1,215
$1,239
$615
$201
$610
$1,430
$6,127
$387
$224
$86
$1,453
$316
$441
$1,176
$182
$25
$31 (D.C.)
$170
$1
$169
$3
$6
$20
Range of State Need
in Millions of 1984 Dollars*
Greater than $1000
$500-1000
Less than $500
None
*Total = $23.2 Billion

FIGURE 4 1984 COMBINED SEWER OVERFLOW (CATEGORY V) NEEDS BY STATE

What are the Combined Sewer Overflow Needs for Marine Bay and Estuary Receiving Waters?

The State distribution of combined sewer facilities affecting the tidally-influenced coastal waters of bays and estuaries is shown in Table 4. Nationally, only 10 percent of all CSO facilities affect marine bays and estuaries. Seventeen States have a total of 114 combined sewer facilities potentially affecting these tidal waters. However, these facilities account for about 40 percent of the total Category V dollar needs and 38 percent of the total population served by combined sewers. The national needs for these facilities are estimated to be $9.4 billion. The final eligibility determination for funding these needs under the separate marine CSO fund (section 201(n)(2) of the Clean Water Act) depends on individual reviews of site specific criteria which must be presented in each grant application.

TABLE 4

Combined Sewer Overflow Pollution Control Needs for Marine Bays and Estuaries

(January 1984 dollars in millions)

State	Needs Estimate
Alaska	$ 6
California	396
Connecticut	410
Delaware	181
District of Columbia	31
Georgia	3
Maine	251
Maryland	8
Massachusetts	895
New Hampshire	14
New Jersey	1,010
New York	4,816
Oregon	4
Pennsylvania	512
Rhode Island	316
Virginia	135
Washington	371
Total	$9,359

Reliability of the Needs Estimates

So far in this report we have presented the needs as aggregate State and national totals. However, these needs are made up of individual estimates for more than 22,550 facilities. How consistent are the data? Are the needs for each facility based on the same level of documentation? To draw meaningful results from the needs data, we must look at the reliability of the individual facility estimates.

While, in general, all States followed the same basic procedures in developing their estimates, and all estimates were subjected to the same quality assurance, there are significant differences in the reliability of the data, not only from State-to-State, but also from facility-to-facility. Not all facilities have progressed to the same level of planning. Almost 60 percent of the current 1984 needs ($51 billion) are based on approved facility plans with detailed cost estimates. The rest ($34 billion) lack completed facility planning. Although these needs are reported in this survey, the cost estimates are far less reliable than those based on facility plans. For the incremental eligible year 2000 needs, 56 percent ($9.3 billion) are based on facility planning.

How Reliable are the Estimates?

To account for the wide range in the quality of documentation available to support the cost estimates, the needs have been broken down into three levels of reliability, as follows:

- Reliability Level 1: Needs based on specific facility planning documents. This includes estimates for facilities both with and without current works in operation.
- Reliability Level 2: Needs based on construction cost curves for facilities that currently have some type of works in operation or under construction. No facility planning has been completed for the remaining needs.
- Reliability Level 3: Needs based on construction cost curves for facilities that currently have no works in operation or under construction. No facility planning has been completed.

Figure 5 shows the distribution by levels of reliability of both current 1984 and incremental eligible year 2000 needs. Needs in Reliability Level 1 tend to represent larger urban communities that are well into the planning stages prior to construction. In contrast, Reliability Level 3 needs represent numerous small, rural communities that are only now beginning to formulate solutions to municipal wastewater problems.

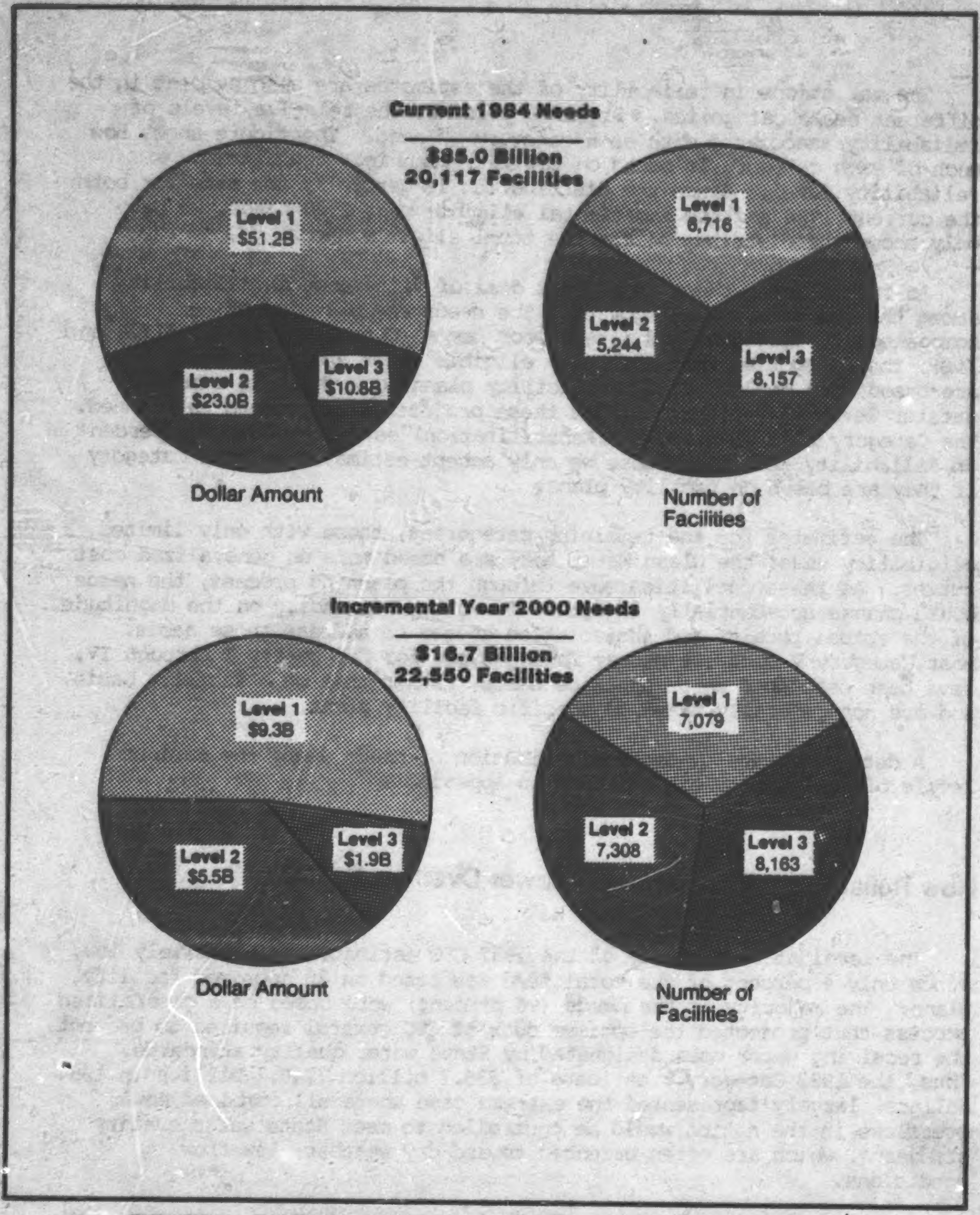


FIGURE 5 DISTRIBUTION OF 1984 NEEDS SURVEY ESTIMATES BY LEVEL OF RELIABILITY (ALL NEEDS CATEGORIES)

The variations in reliability of the estimates are also evident in the different needs categories. Figure 6 presents the relative levels of reliability associated with each category of need. The figure shows how much of each category is based on facility planning, the highest reliability level. Since the distribution is generally the same for both the current 1984 and the incremental eligible year 2000 needs, we have only shown the distribution for the total eligible needs.

As can be seen, there is a great deal of difference in reliability among the Needs Survey categories. The needs estimate is not homogeneous. Treatment and interceptor needs (Categories I, II, IIIA, and IVB), the categories that are fully eligible under the Clean Water Act, are based more predominantly on facility planning. There is a much greater level of reliability that these projects will proceed as planned. The Category IIIB (Replacement/Rehabilitation) estimate shows 100 percent in Reliability Level 1 because we only accept estimates in this category if they are based on facility plans.

The estimates for the remaining categories, those with only limited eligibility under the Clean Water Act, are based more on generalized cost curves. As these facilities move through the planning process, the needs could change substantially in either direction, depending on the magnitude of the actual problem and the solution chosen to address those needs. Most Category V cost estimates, unlike those for Categories I through IV, have been developed on an areawide basis, rather than on a facility basis, and are not generally based on specific facility plans.

A detailed State-by-State distribution of needs among the various levels of reliability can be found in Appendix A.

How Reliable are the Combined Sewer Overflow Estimates?

The level of reliability of the 1982 CSO estimate was relatively low, since only 4 percent of the total need was based on 26 approved facility plans. The majority of the needs (96 percent) were based on a generalized process that projected the optimum cost of CSO control required to protect the receiving water uses designated by State water quality standards. Thus, the 1982 Category V estimate of $35.7 billion ($40.2 billion in 1984 dollars) largely represented the extreme case where all combined sewer overflows in the nation would be controlled to meet State water quality standards, which are often oriented toward dry weather, low-flow conditions.

Requirements for documentation of the Category V CSO need in the 1984 survey were relaxed to include 137 areas with acceptable State planning documents, in addition to the 26 approved facility plans. In examining the reliability of the estimates during the 1984 Needs Survey, we found that CSO control needs reported in the available planning documents were much lower than the generalized Needs Survey estimates (by approximately

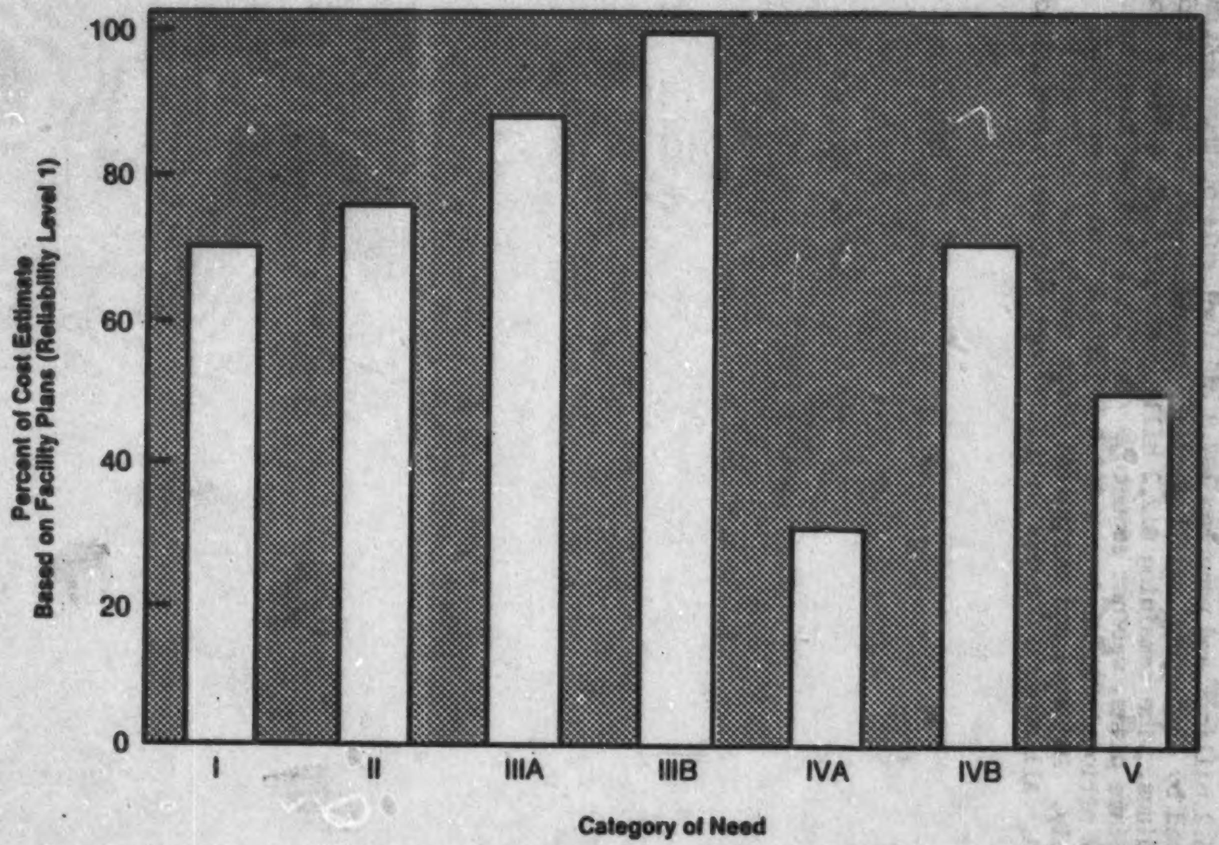


FIGURE 6 RELATIVE LEVELS OF RELIABILITY OF THE NEEDS SURVEY CATEGORIES

$4.9 billion), often because of the site-specific considerations of actual water use attainability. Without the benefit of water use studies, the Needs Survey's generalized cost-estimating technique assumes that all points in one combined sewer area require equal control, although their receiving waters could differ. Typically, however, use attainment can be achieved by construction of CSO controls at selected, rather than all, overflow points. In addition, we found that CSO control costs are higher in urban areas than in rural areas. To correct these discrepancies, the urban ($15.2 billion) and nonurban ($7.8 billion) rule-of-thumb estimates were reduced by 43 percent and 71 percent, respectively, to account for these findings. The remaining $12.2 billion of CSO need, derived from specific State plans, was not adjusted. The total 1984 adjusted and unadjusted national CSO needs are $23.2 billion and $35.3 billion, respectively. Adjusted and unadjusted State totals can be found in Appendix A. All other CSO needs in this report represent adjusted totals.

Impact of the 1981 Construction Grant Amendments

The 1981 Construction Grant Amendments substantially altered the level of Federal participation in grant awards to municipal wastewater treatment facilities. Changes in reserve capacity eligibility, Federal grant share, eligible funding categories, and the discretion of Governors to fund projects in otherwise ineligible categories, greatly altered both the potential future level of Federal grant participation and the level of eligible needs. Earlier in this report we discussed the impact of the Amendments on eligible levels of reserve capacity and the eligible funding categories. In this section we will discuss their impacts on the potential level of future Federal investment if all needs are satisfied. In addition, we will address the impact on the needs arising from the redefinition of secondary treatment.

How do the 1981 Amendments Affect the Potential Future Federal Investment?

The Federal grant share and the grandfathering provisions for phased and segmented projects, as well as the previously discussed eligibility limitations, affect the potential amount of future Federal investment in municipal wastewater facilities. In general, after October 1, 1984, the Federal grant share is 55 percent, except for a 20 percent bonus for innovative and alternative projects, or if the Governor decides to modify the Federal share to a lower percentage rate uniform throughout the State. If an initial phase or segment of a facility was awarded before October 1, 1984, the remaining phases or segments, including full reserve capacity under the grandfathering provision, would receive 75 percent grants (or the lower uniform rate as determined by the Governor).

Based on these provisions, we have calculated the potential future Federal investment to be $35.8 billion. This compares with the estimate of $37.3 billion ($41.8 billion in January 1984 dollars) presented in the 1982 Needs Survey. The differences can be related to more accurate identification of projects eligible for the grandfathering provisions for Federal grant share and reserve capacity eligibility, grant awards made during the past 2 years, and the updated cost estimates for all categories of need.

To calculate the potential future Federal investment, it was necessary to make certain assumptions concerning future activity in the construction grants program. The major assumptions are as follows:

- The annual rate of capital investment would remain the same as it is today, using the present State allotment formula for Federal appropriations.

- Each State would use 15 percent of its yearly allotment for the various set-asides: 1 percent for water quality studies, 4 percent for State program management, and 10 percent for funding of otherwise ineligible categories of projects (Categories IIIB, IVA, and V). For this last set-aside we assumed that, on the average, each Governor would use one-half of the maximum 20 percent that can be used for this purpose.

- Each State would split its remaining allotment evenly between funding the continuation or completion of phased/segmented projects and starting new projects.

- All nongrandfathered projects were assumed to be funded at a 55 percent Federal share, except for those identified as innovative or alternative, which received 75 percent funding. Grandfathered projects were assumed to be funded at a 75 percent Federal share.

- The reserve capacity requirements for nongrandfathered projects were determined using State-supplied 1990 population estimates to calculate a 1990 flow.

There are many uncertainties in the calculation, and a careful review of the assumptions should be made to fully understand the implications of the total projection. A change in any of these assumptions would change the total projected potential Federal investment.

What is the Impact of the Redefinition of Secondary Treatment?

Based on section 23 of the 1981 Construction Grant Amendments, EPA developed a rule amending the secondary treatment regulation. This rule establishes categories of facilities that are deemed equivalent to secondary treatment (i.e., trickling filters and waste stabilization ponds) and establishes new (not to be exceeded) limitations for such facilities. The rule states that the effluent quality that is generally attainable by the trickling filter unit process or the waste stabilization pond treatment process be considered equivalent to secondary treatment as long as water quality is not adversely affected.

We have prepared an estimate of the potential savings in capital construction costs that would be realized by municipalities if the new options were adopted universally. The estimate is shown in Table 5. These potential savings are not reflected in any of the other need totals because they depend largely on decisions yet to be made by each permitting authority. Therefore, the estimate is a maximum; the actual amount could be considerably less.

TABLE 5

Potential Capital Cost Savings
from Redefinition of Secondary Treatment

(January 1984 dollars in billions)

	Total Needs	Potential Savings
Existing Facilities	$0.37	$0.37
New Facilities	2.65	1.51
Total	$3.02	$1.88

The estimate of savings is broken into two parts: savings at existing facilities and savings at new facilities. Savings at existing facilities would be realized if the authority could forego an upgrading program and continue to utilize an existing trickling filter or lagoon process until it requires replacement. Savings at new or replacement facilities would be realized if the authority could choose a less costly process train and still achieve the new equivalent limits for secondary treatment.

How Needs Have Changed

Needs have varied considerably from survey-to-survey. A comparison of the total year 2000 needs for the past three surveys is presented in Table 6. For comparison purposes, the needs have all been presented in current 1984 dollars. We have also included a total line in nominal dollars (the face dollar value not adjusted for inflation) so that these numbers can be easily related to past survey reports. Appendix B provides the State distribution of 1982 needs by category.

TABLE 6

Comparison of Total Year 2000 Needs
1980 through 1984 Needs Surveys

(January 1984 dollars in billions)

Needs Category		1980 Survey	1982 Survey	1984 Survey
I	Secondary Treatment	$35.9	$34.3	$32.6
II	Advanced Treatment	7.0	6.3	5.6
IIIA	Infiltration/Inflow	3.2	2.9	2.8
IIIB	Replacement/Rehabilitation	7.7	5.3	3.2
IVA	New Collector Sewers	23.8	23.4	22.2
IVB	New Interceptor Sewers	27.5	20.2	19.3
V	Combined Sewer Overflows	48.0	40.2	23.2
Total I, II, IIIA, and IVB		$73.6	$63.7	$60.3
Total I-V		$153.1	$132.6	$108.9
Total I-V (Nominal dollars)		$119.9	$118.4	$108.9

Many factors contribute to these changes. Inflation, grant awards, new facility planning, and revised estimating procedures all contribute to the differences. To illustrate the relative magnitude and impact of these various factors, Table 7 quantifies the major areas of change between the 1982 and 1984 survey estimates for year 2000 populations.

TABLE 7

Changes in Total Year 2000 Needs Between the 1982 and 1984 Needs Surveys

(Nominal dollars in billions)

Type of Change	Change in Needs
Grant awards	-$6.3
Inflation for 1982 and 1983	+16.4
Facility additions to survey	+1.2
Facility deletions from survey	-1.5
Better available planning (including State CSO plans)	-8.5
Adjustments to CSO need	- 10.8
Net Change	-$9.5

As you can see, inflation dramatically affects needs. If inflation were omitted, the net decrease in the total year 2000 needs would be $25.9 billion. Besides inflation, the largest impact on the needs estimate was due to the adjustment to the CSO need (this adjustment has been discussed in detail earlier in this report). The other major impact, a $8.5 billion decrease, occurred because of the better levels of planning available to document the needs in Reliability Level 1, particularly for the CSO need, and the improved cost curves used for the Reliability Level 2 and 3 estimates.

How Much Has Been Invested in Municipal Wastewater Treatment?

As discussed previously, construction grant funding by municipalities, States, and the Federal government is one of the major reasons why real needs have decreased over the years. Since passage of the Clean Water Act in 1972, there has been an investment of more than $56 billion in Federal, State, and local funding (source: America's Clean Water). The distribution of Federal wastewater treatment grant awards during this period is shown by hydrologic region in Figure 7 and by subbasin in Appendix C.

What Were the Results?

Despite increases in population, significant water quality gains have been achieved since the enactment of the Clean Water Act. Construction grant funding has resulted in the construction or improvement of approximately 3,500 treatment facilities. The nation's waters have benefited from providing municipal wastewater treatment improvements to a total of 21 million people.

The States' evaluation of progress, presented by the Association of State and Interstate Water Pollution Control Administrators in America's Clean Water, estimates national water quality improvements from 1972 to 1982. Out of 758,000 stream miles evaluated, the report states that "... in the 49 States that reported on water quality conditions between 1972 and 1982, 296,000 miles were reported to have maintained the same water quality, 47,000 miles improved, and 11,000 miles have been degraded." Pollutants discharged from municipal plants were reported to have decreased by 46 percent in that period. Our report now looks at how future water quality could be affected as the current and future needs are met.

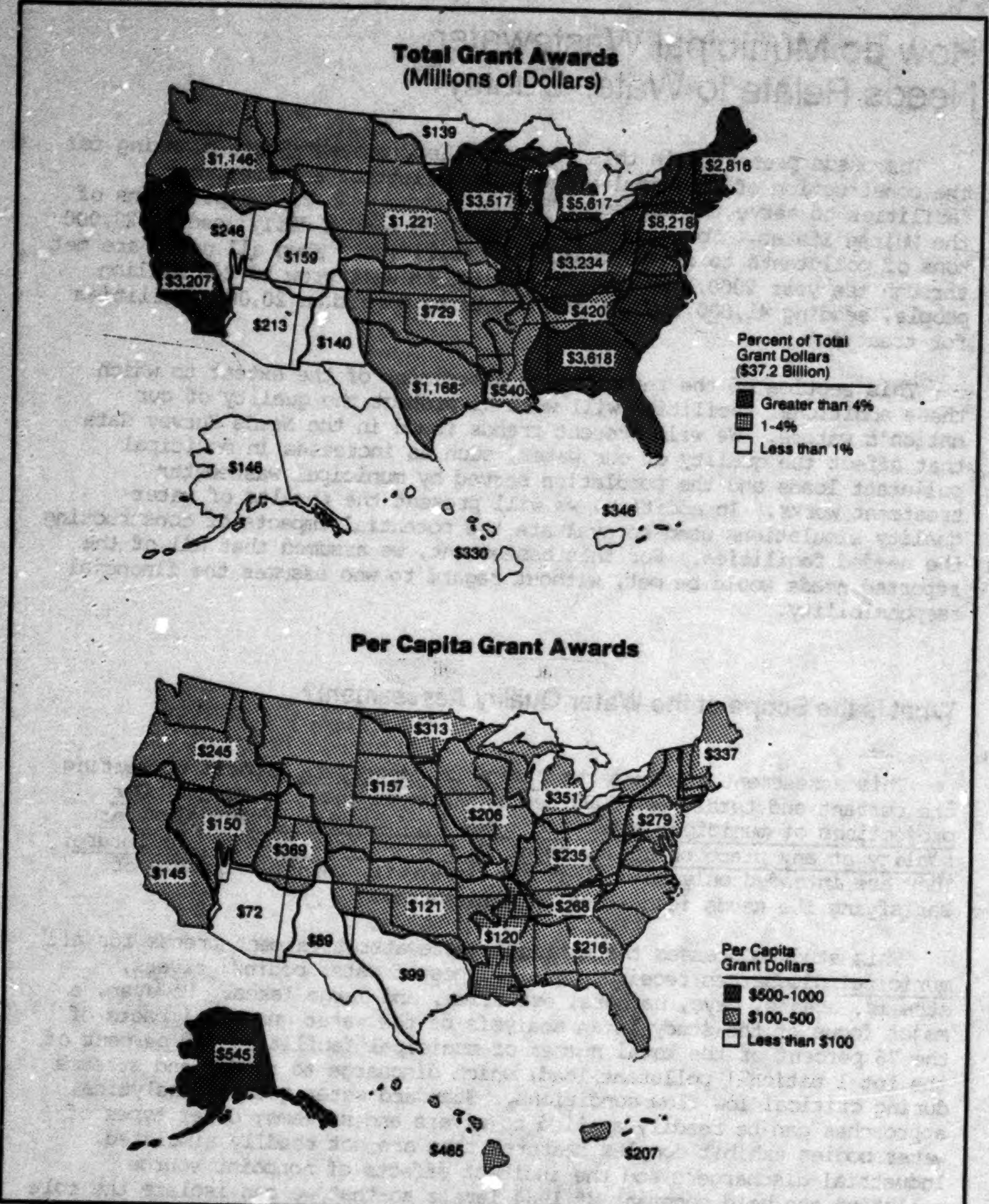

Total Grant Awards
(Millions of Dollars)
$139
$1,146
$2,816
$3,517
$5,617
$8,218
$1,221
$246
$159
$3,234
$3,207
$729
$420
$213
$140
$3,618
$1,168
$540
Percent of Total Grant Dollars ($37.2 Billion)
Greater than 4%
1-4%
Less than 1%
$146
$346
$330
Per Capita Grant Awards
$313
$337
$245
$157
$351
$206
$279
$150
$369
$235
$145
$72
$121
$268
$120
$89
$216
$99
Per Capita Grant Dollars
$500-1000
$100-500
Less than $100
$545
$465
$207

FIGURE 7 DISTRIBUTION OF FEDERAL WASTEWATER TREATMENT GRANT AWARDS UNDER THE CLEAN WATER ACT BY HYDROLOGIC REGIONS

How do Municipal Wastewater Needs Relate to Water Quality?

The needs presented in this report reflect present State planning for the construction of municipal wastewater collection and treatment facilities to serve the current 1984 and future year 2000 populations of the United States. Today, 169 million people send a daily load of 23,000 tons of pollutants to 15,400 municipal facilities. When all needs are met through the year 2000, the sewered population will grow to 246 million people, sending 41,000 tons of pollutants to more than 20,000 facilities for treatment.

This section of the report is an assessment of the extent to which these additional facilities will work to protect the quality of our nation's waters. We will present trends found in the Needs Survey data that affect the quality of our water, such as increases in municipal pollutant loads and the population served by municipal wastewater treatment works. In addition, we will present the results of water quality simulations used to evaluate the potential impacts of constructing the needed facilities. For this assessment, we assumed that all of the reported needs would be met, without regard to who assumes the financial responsibility.

What is the Scope of the Water Quality Assessment?

This assessment examines the basinwide, aggregate impacts of meeting the current and total year 2000 needs, whenever that may occur. Our projections of municipal impacts are not a prediction of actual water quality at any place or at any point in time - past, present, or future. They are intended only to reflect the potential, relative impacts of satisfying the needs identified in this survey.

This study addresses the national wastewater treatment trends for all municipal discharges received by all types of water bodies: rivers, streams, oceans, bays, harbors, estuaries, and large lakes. However, a major focus of the study is an analysis of the water quality impacts of the 76 percent of the total number of municipal facilities (62 percent of the total national pollutant load) which discharge to rivers and streams during critical low flow conditions. Standard water quality analytical approaches can be readily applied to rivers and streams; other types of water bodies exhibit complex features that are not readily simulated. Industrial dischargers and the indirect effects of nonpoint source pollution are held constant at 1984 levels so that we can isolate the role of the municipal wastewater treatment facilities.

For this study, an acceptable level of water quality is considered achieved when the dissolved oxygen averaged over the length of the receiving stream segment meets the State water quality standards. Changes in acceptable water quality are reported in terms of the number of stream segment miles affected.

For simplification, municipal pollution estimates in this report represent the pollutant most common to domestic sewage - biochemical oxygen demand (carbonaceous and nitrogenous). The biochemical oxygen demand in wastewater lowers the level of instream dissolved oxygen which is essential to the support of aquatic life and public use. We recognize, however, that other pollutants, including some toxic materials, exist in municipal influent and are partially removed by wastewater treatment.

This report does not evaluate the direct relationship of needs to public health. Public health gains from construction of municipal treatment works are extensive, although somewhat intangible and difficult to quantify. This report does address the water quality implications of meeting the future needs of presently unsewered areas, which are often public health related. Sewering these areas may eliminate severe public health hazards associated with underground public and private drinking water sources or surface-water contamination from failing septic systems.

In our simulation analysis of water quality in rivers and streams, we have made a clear distinction between the levels of reliability of the needs estimates for individual facilities, similar to that discussed earlier in this report. Facilities with needs based on detailed planning or with currently operating treatment works (Reliability Levels 1 and 2) are more likely to proceed as reflected in the Needs Survey. Other potential facilities (Reliability Level 3) may be changed to higher levels of treatment or to nondischarging systems before construction is initiated. The findings of our water quality analysis should be interpreted accordingly.

The last factor to be considered is the quality of the data used in the water quality simulations. While most data received sufficient State review and analysis to assure the credibility of our overall results, data quality varies substantially among the States. About 10 States with limited resources were unable to provide an extensive quality review effort, and about five States chose not to participate at all. In these cases, basinwide surrogates, rather than individual water quality parameters, were used for the various water bodies. Since we developed and reported our results on an aggregate basis, however, this approach did not severely impair the overall results of our analysis.

What did the Water Quality Assessment Show?

The Clean Water Act requires municipal dischargers to comply with effluent standards designed to protect water quality. How well do the municipal needs reported by States accomplish this goal? What will be the impact of meeting the needs identified in this survey? The 1984 Needs Survey assessment provides the following conclusions:

- Satisfying current needs will provide further water quality improvements. Meeting the current 1984 treatment needs for facilities with detailed facility planning or with current works in operation (Reliability Levels 1 and 2) would result in significantly improved levels of water quality, matching the gains of the past decade. The rate of improvement, however, depends on the rate at which the needs are met. Satisfying the needs of the current population will require the treatment of greater volumes of domestic wastes at increasing levels of facility performance.

- Increased effort is needed to maintain water quality in the future. As the nation's population increases through the year 2000, the reported needs do not adequately reflect the measures necessary to accommodate future increased pollutant loads. Meeting water quality goals will require changes in some of the projected pollution control measures, as well as their associated cost estimates. As population increases toward the end of the century, State and local governments will have to continue implementing their responsibility for construction of needed capacity, so that water quality progress already made will continue. In fact, even though increased population will add substantial new flows to the nation's waters, future water quality would be no worse than it is today when State and local governments construct the needed facilities. Only if the State and local governments do not implement needed new capacity would future water quality be worse than existing conditions.

- Further planning is necessary for many poorly documented facilities. The needs for Reliability Level 3 facilities (those without facility planning or current works in operation) must be reevaluated. The planning for population growth and additional sewer areas is very preliminary. Additional safeguards, such as nondischarging treatment systems or higher treatment levels, may be necessary to mitigate adverse water quality impacts.

Why?

Water quality improvements in the period prior to 1984 reflect the efforts of States and municipalities to attain secondary or higher levels of treatment following enactment of the 1972 Federal Water Pollution Control Act Amendments. Secondary treatment of raw and primary municipal discharges has resulted in significant increases in water quality. To date, the Federal construction grants program, together with State and local programs, has made great strides in cleaning up water pollution near the major population centers on larger rivers.

This national progress will continue as we meet the remaining needs of the current 1984 population. These current needs concentrate on completing the job of providing secondary treatment for the 202 remaining raw discharges and the more than 2,600 facilities now operating at insufficient levels of treatment. When current needs are met, the number of people served by municipal treatment works will increase by 32 percent, while the effluent pollutant load will decrease by 34 percent. When the current, well-documented needs, in Reliability Levels 1 and 2 are met, the quality of most present receiving waters will be maintained, and many other streams not presently capable of supporting their designated uses will be restored.

By the year 2000, though, today's service population could increase by almost 55 percent, with an effluent pollutant load increase of 9 percent. With the apparently insufficient level of needs identified in this report to address this increased load, the overall level of water quality would be essentially the same as it is today for areas with needs in Reliability Levels 1 and 2. The gains that were made by meeting the current needs would be offset by the effects of increased population and decreased pollutant removal capability. Additional pollution control measures will be required to ensure continued improvements in water quality as these needs are met.

If we include the largely undocumented Reliability Level 3 needs, the situation could become even more acute. Many of these needs are for providing secondary levels of treatment to new growth areas or areas that are currently served by nondischarging facilities such as septic tanks. These new discharges, often to smaller headwater streams, could result in new water quality impairments unless appropriate control measures are taken. As final plans for these facilities are developed, many will undoubtedly recommend higher levels of treatment or alternate methods of disposal to ensure that additional impairments do not occur.

These conclusions can be explained by the interaction of four factors:

- Increasing population and pollutants. In this Needs Survey, States project that 72 million people will receive new or improved levels of treatment and collection when the total year 2000 needs are met. This population increase will generate a national pollutant increase of 55 percent to confront future wastewater treatment facilities.

- Stabilizing pollutant removal capability. Although national flows and pollutant levels reaching facilities are projected to increase substantially, the Needs Survey indicates that the planned capability of municipal facilities to remove pollutants efficiently will increase only slightly and then level off. Unless reported year 2000 pollution control measures are changed, future loads to receiving waters would increase. Coupled with the constant or decreasing assimilative capability of these waters, the increased load will limit water quality improvements when the total year 2000 needs are met. However, not addressing the current and year 2000 needs could result in severe water quality degradation of the nation's rivers and streams.

- Decreasing level of identified needs. A comparison of per capita needs for the population receiving new or improved wastewater treatment suggests that the reported current and future needs may be underestimated. In general, as needs are projected into the future, they tend to shift from urban centers to nonurban areas characterized by lower population density, where higher per capita needs would be expected. However, both current and total year 2000 per capita needs are less than that reflected by the capital investment prior to 1984. Eligible municipal treatment improvements since the 1978 Needs Survey reflect a per capita investment of $2,700 (nominal dollars). On the other hand, satisfying current 1984 and total year 2000 needs will provide new or improved service at a total per capita cost of only $1,215 and $1,190 (1984 dollars), respectively. When planning for the new facilities has advanced to the point of addressing specific pollution control problems, the individual needs may increase somewhat.

- Municipal loads in new places. The needs assessment shows a potential for replacing large numbers of nondischarging treatment systems with collection and treatment facilities to serve nonurban growth areas. Most of these needs are based on very preliminary State planning and are not very well documented. As a result, surface-water discharges are assumed where they did not exist before. In providing wastewater collection and treatment to these areas, additional levels of treatment or alternate disposal techniques may be necessary. Otherwise, the assimilative capacity of many of the small streams adjacent to the currently nonsewered areas would not be sufficient to accept a secondary effluent.

Change in Pollutant Removal Capability

Future treatment levels identified in the needs estimates do not appear to be adequate to address the projected future increase in pollutant loads. The existing pollutant removal capability of municipal facilities will increase by about 6 percent nationwide as higher levels of treatment are achieved in meeting current needs. Treatment levels will increase again by approximately the same amount when total year 2000 needs are met, but the increase will not be adequate to compensate for the increased loads generated by population growth. Therefore, many of the projected pollution control measures must be reevaluated. Otherwise, water quality would only be maintained, but not improved, when the total year 2000 needs are met.

Change in Pollutant Load Distribution

The impacts of the increased loads will not be uniform throughout the country. These impacts are influenced by variations in population and geography, as well as by the size, type, designated use, and assimilative capacity of the water body. Future water quality impacts vary from basin to basin, according to how the States project their future growth patterns.

According to the projected location of future facilities identified in the Needs Survey, small streams will receive a greater portion of the future loads as the total needs through the year 2000 are met. The ratio of small streams to large streams receiving municipal loads is predicted to double in the future. Today's number of facilities discharging to small headwater streams that are more than one half wastewater will increase by 46 percent when total year 2000 needs are met.

Future loads discharged to streams with higher designated uses, such as contact recreation and cold water fisheries, will increase by 69 percent at the time the total year 2000 municipal wastewater treatment needs are achieved. The current and future distributions of pollutant loads by stream use objective are displayed in Figure 8.

Reliability of the Pollutant Load Estimates

Just as the cost estimates for individual facilities have differing levels of reliability, so do the predicted effluent loads. The needs in Reliability Levels 1 and 2 are generally for urban areas with detailed engineering plans that seek to minimize the negative impact of new pollutant loads. On the other hand, many of the needs for presently unsewered areas, as well as those for the future population, are concentrated in nonurban areas, estimated mainly by generalized cost curves with little, if any, documentation. These needs have the lowest reliability (Reliability Level 3).

Included in these Reliability Level 3 needs are preliminary proposals to replace septic tanks now in operation in 4,500 communities with new treatment facilities. Without the benefit of site-specific planning, the future discharge from many of these planned facilities has been assigned to the downstream segment nearest the population center. Often, in these cases, the assigned receiving stream has insufficient flow to accommodate the assumed plant effluent load and could be impaired unless the prospective treatment facilities are changed. Approximately 65 percent of the future increase in small headwater receiving streams that are more than one half wastewater is caused by facilities in Reliability Level 3. Final facility plans for many of these communities may well call for advanced treatment or nondischarging facilities such as land treatment, containment ponds, or upgraded soil adsorption systems, to prevent adverse water quality impacts.

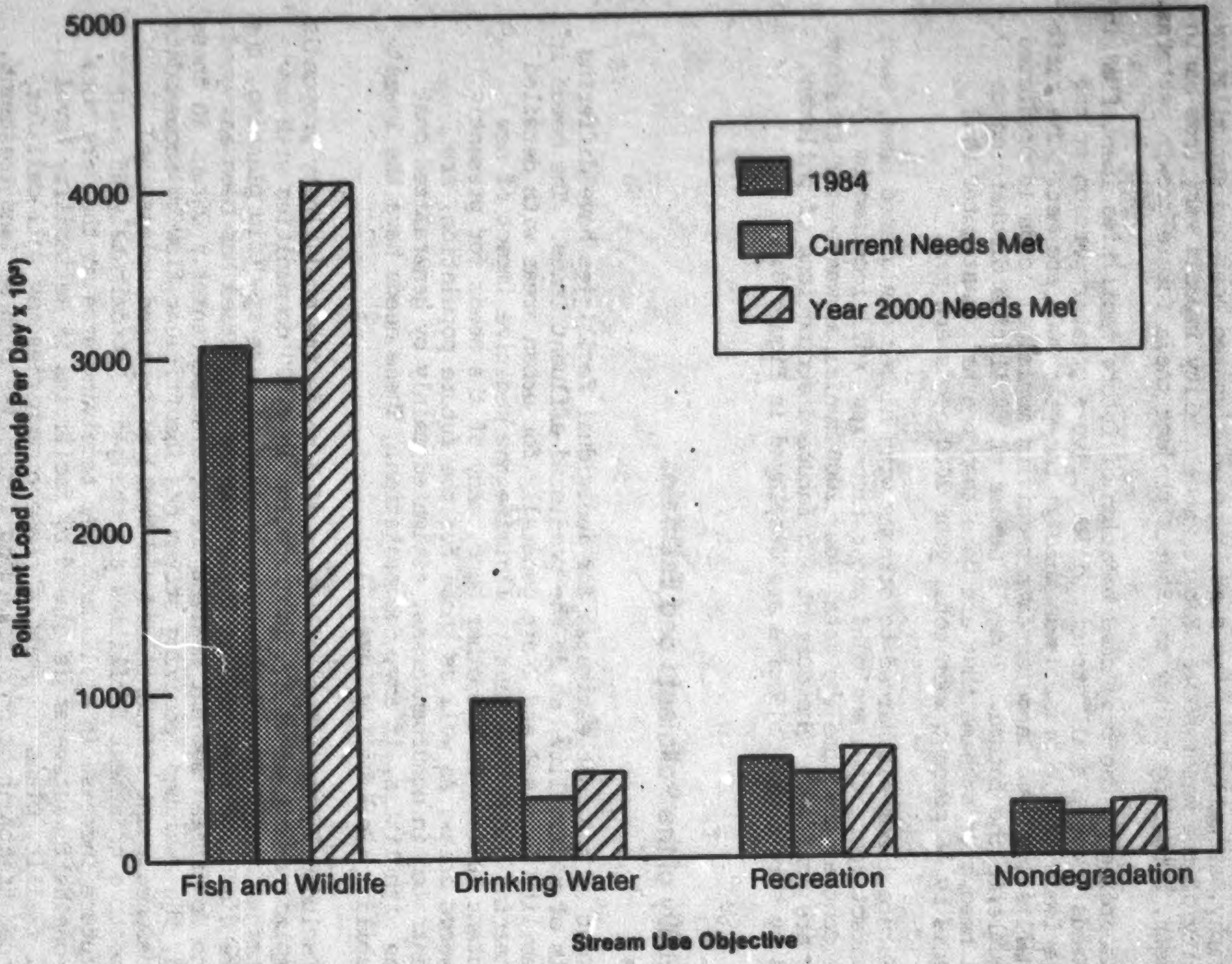


FIGURE 8 DISTRIBUTION OF POLLUTANT LOADS BY STREAM USE OBJECTIVE

How Will Pollutant Loads Affect Water Quality When Needs are met?

This report has looked closely at municipal pollutant loads and how their size and distribution vary when current 1984 and total year 2000 needs are met. Furthermore, it has suggested how these changes may affect the capability of receiving waters to assimilate the loads. Now we will examine how future municipal loads to streams and rivers may impact instream water quality. In the analysis we focused on evaluating the effects of meeting current needs for facilities with current construction or approved facility plans (Reliability Levels 1 and 2), because they have benefited from detailed planning and are more likely to proceed as planned.

About 122,000 miles of river and stream segments in the United States currently receive municipal wastewater discharges, all of which have State water quality standards for dissolved oxygen. Out of the 122,000 miles, approximately 89,000 miles are currently meeting the State water quality standard for disselved oxygen. Causes of the remaining miles not meeting their dissolved oxygen standard may stem from muncipal, industrial, or nonpoint sources of pollution. The State water quality standards used in this report are currently under State review in accordance with section 303(c) of the Clean Water Act.

Meeting the needs of the current population would improve, maintain, or eliminate discharges from about 87,000 miles. Changes in the reported pollution control measures for our year 2000 population must be considered. Continued improvements in water quality will require modification to some of the municipal wastewater treatment measures projected for the year 2000 population.

Additional changes in planning are also necessary for the current and year 2000 needs in Reliability Level 3. The planning for population growth and additional sewer areas is very preliminary. Additional safeguards, such as nondischarging treatment systems or higher treatment levels, may be necessary to mitigate adverse water quality impacts.

A Final Note

For the first time in the construction grants program, the Needs Survey has considered the relationship of needs to future water quality. We did so in a variety of ways to maximize our confidence in the findings. We looked at trends implied by the Needs Survey data, by nation and by hydrologic region, and compared these trends to various hydrologic and water use data. In addition, we estimated the overall potential changes in the water quality of rivers and streams when, and if, the reported municipal wastewater treatment needs are met.

This analysis has provided us with valuable insights into the potential future impacts of addressing our municipal pollution problems, and will provide a firm foundation for future surveys of needed municipal wastewater treatment facilities. Our plans for continued examination of the initial results may lead to additional findings or other significant enhancements to our analytical approach. Any significant new findings will be provided as an addendum to this report.

Glossary of Terms

NOTE: Those definitions of terms that are also defined in EPA regulations or other documents, e.g., 40 C.F.R. 35.2005, are intended to summarize and simplify the definitions for the purposes of this report, not to change the meaning of the terms.

Advanced Treatment (Category II)

A level of treatment more stringent than secondary treatment. Advanced treatment requires a greater than 85 percent reduction in conventional pollutants, or a significant reduction in nonconventional pollutants present in the wastewater treated by a facility. Needs reported in Category II are necessary to attain incremental reductions in pollutant concentrations beyond basic secondary treatment.

Ammonia (Ammonia Toxicity)

A biologically-active compound composed of hydrogen and nitrogen, which is present in most waters and wastewaters. Ammonia is a normal biological degradation product of nitrogenous organic matter. Depending on the concentration of ammonia, and the temperature and alkalinity of rivers and streams, ammonia can be highly harmful to fish and invertebrates.

Assimilative Capacity

Ability of a body of water to purify itself of pollutants.

Biochemical Oxygen Demand (BOD)

The amount of dissolved oxygen required to decompose organic matter in water. It is a measure of pollution, since heavy wasteloads have a high demand for oxygen.

Collector Sewers (Category IVA)

A pipe used to collect and carry sewage from an individual source to an interceptor sewer which will convey the sewage to a treatment facility. This category includes the costs of constructing new collector sewer systems and appurtenances designed to collect raw wastewater, and to protect public health from problems such as malfunctioning septic tanks.

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Combined Sewer Overflow (CSO) (Category V)

A discharge of a mixture of stormwater and domestic wastes which occurs when the flow capacity of a sewer system is exceeded during a rainstorm. Costs reported in this category are for grant-eligible facilities to prevent or control periodic bypassing of untreated wastes from sewers which convey a combination of sewage and stormwater to achieve water quality objectives. This category does not include costs for overflow control allocable to flood control or drainage improvement, or for treatment or control of stormwaters in separate storm and drainage systems.

Conveyance Needs

Capital investment needed to construct, expand, or upgrade sewer systems.

Current Needs

Capital investment necessary to address the municipal wastewater treatment needs of the current 1984 population of the United States. This does not include any needs for future population growth.

Designated Use

A system of classifying water utilization in natural waterways that is identified in State water quality standards. Uses can include cold water fisheries, public water supply, fish and wildlife, or recreation.

Dissolved Oxygen (DO)

A measure of the amount of oxygen available for biochemical activity in a given amount of water. Adequate levels of DO are needed to support aquatic life.

Effluent

Liquid that is discharged to the environment from a treatment plant after completion of the treatment process.

Effluent Standard

A limit on how much of a particular pollutant may be discharged by industries and municipalties into the environment. Effluent standards are set for each individual treatment facility. Minimum standards for all plants are set by the Clean Water Act. More stringent standards are set on a case-by-case basis whenever the protection of local water quality warrants.

Eligible Need Categories

Categories of projects that are eligible for Federal financial assistance under the Clean Water Act.

Estuaries

Regions of interaction between rivers and nearshore ocean waters, where tidal action and river flow create a mixing of fresh and salt water.

Facility Plans

Plans that describe the design, processes, cost, and schedule for building a municipal wastewater treatment and conveyance system.

Federal Grant Share

Level of Federal participation in a grant for municipal wastewater treatment facilities. After October 1, 1984, the Federal share is generally 55 percent, except for grandfathered phased/segmented projects that may receive 75 percent, or innovative/alternative projects that may receive a 20 percent bonus (not to exceed 85 percent). The Governor may further reduce the grant share uniformly throughout the State.

Grandfathered Projects

Phases or segments of projects that may receive 75 percent funding and full reserve capacity after October 1, 1984, because a previous phase or segment, described in the same facility planning document, received funding prior to that date.

Hydrologic Flow Path

The path followed by water as it traverses the land.

Hydrologic Region

Any of 21 regions defined by the U.S. Geological Survey. The regions are segregated by common hydrologic and geographic characteristics.

Infiltration/Inflow Correction (Category IIIA)

The penetration of water from the soil into a pipe. Included in this category are costs for correction of sewer system infiltration/inflow problems. Costs are also reported here for preliminary sewer system analysis and for detailed sewer system evaluation surveys.

Influent

Wastewater flowing into a treatment plant.

Interceptor Sewers (Category IVB)

The major sewer receiving wastewater flows from collector sewers. The interceptor sewer carries sewage directly to the treatment plant or to another interceptor. Included in this category are the costs for constructing new interceptor sewers and transmission pumping stations necessary for conveying wastewaters from collector sewer systems to treatment facilities or to another interceptor.

Lagoon

A shallow pond where sunlight, bacterial action, and oxygen work to purify wastewater. Lagoons are widely used by small communities to provide wastewater treatment.

Low Flow

Naturally-occurring flow conditions that happen at a defined frequency during dry weather. The Needs Survey's water quality analysis uses 7-day, 10-year low flow (7Q10), which means the average 7-day low flow occurs once in 10 years.

Marine Waters

Salt-water environment of the oceans and estuaries.

Marine Combined Sewer Overflows

Combined sewer facilities affecting marine bays and estuaries.

Mean Flow

Average stream flow. An example is 30 days (or monthly) average flow.

Nonpoint Source

Pollution sources that are diffuse, from which pollutants run off the land. The commonly-used categories for such sources are agriculture, forestry, urban areas, mining, construction, dams and channels, land disposal, and saltwater intrusion.

Ocean Discharge Waiver

A variance from the secondary treatment requirements for discharges into marine waters.

Phased/Segmented Project

A wastewater treatment works construction project that was divided in its facilities plan into substantial, discrete portions for Federal funding or construction bidding purposes. Phases or segments are generally built in sequence and funded from consecutive yearly appropriations.

Potential Federal Investment

The estimate of the amount of Federal financial assistance that would be necessary if all identified needs were satisfied and the Federal government contributed its full share specified under the Clean Water Act.

Pollutant (Pollutant Load)

The quantity of organic matter in the effluent from a treatment plant which may exert a detrimental effect on a receiving water if the assimilative capacity of the water body is exceeded.

Pollution

A condition created by the presence of harmful or objectionable material in water.

Replacement/Rehabilitation of Sewers (Category IIIB)

Reinforcement or replacement of structurally-deteriorating sewers. This category includes cost estimates for rehabilitation of existing sewer systems beyond those for normal maintenance. Costs are reported if the corrective actions are necessary to maintain the total integrity of the system.

Reserve Capacity

Extra hydraulic capacity which is built into treatment plants and interceptor sewers to accommodate flow increases due to future population growth.

Secondary Treatment (Category I)

The minimum level of treatment which must be maintained by all treatment facilities, except those facilities granted waivers under section 301(h) of the Clean Water Act. Treatment levels are specified in terms of the concentration of conventional pollutants in the wastewater being discharged from a facility. Secondary treatment requires an 85 percent reduction in conventional pollutant concentration in the wastewater treated by a facility. Needs reported in Category I are necessary to attain secondary treatment. Needs to attain incremental reductions in conventional pollutant concentrations beyond secondary treatment requirements are included in Category II.

Septic Tanks

Used to treat sewage on-site by individual houses. The septic tank is the predominate method used to treat sewage from individual houses located in unsewered areas.

Subbasin

A watershed or area drained by a river or stream and its tributaries, which ultimately drains into a larger water body. For the purposes of the Needs Survey water quality data collection and analysis, the continental United States was divided into 314 subbasins, and each subbasin was given a number and a name based on a major water body or other dominant feature. Subbasin delineation follows the U.S. Geological Survey hydrologic classification system based on the 18 hydrologic regions covering the continental United States, which, in turn, include 2,100 catalog units and over 61,000 river and stream reaches and several thousand coastline and lake shoreline segments. Each subbasin contains one or more integral catalog units and is always contained within an hydrologic region; many cross State lines. (Figure 1 in the 1984 Needs Survey report depicts the hydrologic regions by name; Table C-14 lists each subbasin by hydrologic region, number, and name.)

Suspended Solids (SS)

That portion of the pollutants in wastewater that are in the form of very small, solid particles. Suspended solids are removed through a combination of settling and filtering operations.

Treatment Plant

A structure constructed to purify wastewater prior to discharging it to the environment. The purification, or treatment, is accomplished by subjecting the wastewater to a combination of physical, chemical, and biological processes which reduce the concentration of contaminants present in the wastewater.

Trickling Filter Unit Process

A biological treatment process where wastewater is purified by trickling wastewater over rocks on which colonies of bacteria are growing. The bacteria remove the organic impurities from the wastewater and utilize it as a food source. Newer versions of the trickling filter process use plastic cubes or redwood slats to support the bacteria colonies. These newer types of support media allow for greater removal of impurities than the original rock media. The name trickling filter is a misnomer since no filtering action in a physical sense occurs.

Unit Process Train

The combination of physical, chemical, and biological operations which are used by a treatment plant to attain the required level of treatment.

Urbanized Area

Refers to the area surrounding cities which have more than 50,000 residents. The urbanized areas delineated by the Bureau of the Census are used for Needs Survey purposes.

Water Quality

The chemical, physical, and biological characteristics of water with respect to its suitability for a particular purpose. For the purposes of this report, suitable water quality is achieved when the water is capable of fully supporting the State-designated use or water quality standard for dissolved oxygen and ammonia.

Water Quality Standards

Requirements authorized by State law that consist of designated uses for all waters and minimum acceptable levels of water quality that will permit achievement of these uses. The criteria can be numerical or narrative. Standards are developed in a public decision-making process and reviewed and approved by EPA.

Water Quality Simulation (Water Quality Modeling)

Generally accepted water quality relationships and algorithms developed to approximate the behavior of pollutants in streams and rivers. Water quality factors include the stream's ability to reabsorb oxygen from the atmosphere, physical features such as stream elevation, climatic conditions such as temperature, and stream flow. Typically, water quality impacts are estimated in terms of stream miles and in-stream chemical composition, and are compared to both the State water quality standards and the stream's assimilative capacity.

Year 2000 Needs

The capital investment necessary to address the publicly owned wastewater treatment needs required to adequately serve the current population plus population growth through the year 2000.

Appendix A

Cost Summaries

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Introduction

This appendix contains State and national summaries of the various cost estimates collected during the 1984 Needs Survey. Included are summaries of eligible current 1984 needs, eligible year 2000 needs, and total year 2000 needs by Needs Survey category. The eligible needs are those portions of facilities eligible for Federal financial assistance under the Clean Water Act. The total year 2000 needs include reserve capacity beyond that eligible under section 204(a)(5). In addition, tables are included that present the levels of reliability for each cost estimate.

Current 1984 Publicly Owned Wastewater Treatment Needs Eligible for Federal Financial Assistance Under the Clean Water Act

Table A-1 summarizes the EPA assessment of needs by State for the current 1984 population. All values are given in millions of 1984 dollars.

The current 1984 needs represent the capital investment necessary to build all publicly owned wastewater treatment facilities needed to bring our current population into compliance with the requirements of the Clean Water Act. The current needs do not contain an allowance for future population growth and migration. The assessment includes all planning, design, and construction activities eligible for Federal financial assistance under the Clean Water Act. All ineligible project costs are excluded from the assessment.

TABLE A-1

CURRENT 1984 PUBLICLY OWNED WASTEWATER TREATMENT NEEDS ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE UNDER THE CLEAN WATER ACT

(January 1984 dollars in millions)

		Category of Need						
	Total	I	II	IIIA	IIIB	IVA	IVB	V
Alabama	$ 811	$ 255	$ 77	$ 89	$ 2	$ 303	$ 85	$ 0
Alaska	166	75	0	5	0	21	59	6
Arizona	533	204	64	10	1	150	104	0
Arkansas	345	141	36	30	2	101	35	0
California	4,140	1,325	39	339	468	1,204	251	514
Colorado	147	95	9	5	1	19	3	15
Connecticut	1,709	417	75	17	20	570	169	441
Delaware	274	25	1	5	5	31	25	182
Dist. of Columbia	299	97	171	0	0	0	0	31
Florida	2,885	850	214	117	18	1,216	467	3
Georgia	989	220	143	67	15	241	134	169
Hawaii	369	83	0	0	19	222	45	0
Idaho	218	78	2	6	3	93	28	8
Illinois	3,906	571	256	166	38	160	193	2,522
Indiana	1,978	297	106	21	3	242	94	1,215
Iowa	950	407	87	63	2	111	114	166
Kansas	654	128	1	20	22	86	145	252
Kentucky	1,317	277	86	80	6	487	180	201
Louisiana	980	298	22	85	18	380	177	0
Maine	884	157	2	22	10	201	105	387
Maryland	1,108	165	502	57	57	220	82	25
Massachusetts	4,539	1,357	108	35	20	874	692	1,453
Michigan	3,131	945	229	39	97	494	597	730
Minnesota	1,274	322	77	19	20	119	203	514
Mississippi	509	216	56	59	1	105	72	0
Missouri	2,784	791	3	49	272	247	397	1,025
Montana	61	16	2	1	1	25	15	1
Nebraska	174	128	0	1	1	21	7	16
Nevada	94	40	22	3	3	20	6	0
New Hampshire	1,003	220	3	9	5	292	250	224
New Jersey	4,562	2,204	130	180	78	289	505	1,176
New Mexico	99	53	1	0	1	35	9	0
New York	14,701	3,182	168	186	1,507	2,522	1,009	6,127
North Carolina	1,037	249	90	97	1	436	163	1
North Dakota	23	9	0	0	0	4	2	8
Ohio	4,400	672	491	99	233	597	1,069	1,239
Oklahoma	395	156	56	13	11	87	72	0
Oregon	974	84	13	78	18	267	70	444
Pennsylvania	4,319	1,234	258	14	3	1,134	246	1,430
Rhode Island	754	128	8	1	39	176	86	316
South Carolina	732	163	34	75	0	276	184	0
South Dakota	96	50	12	1	1	3	5	24
Tennessee	1,688	349	77	157	12	409	74	610
Texas	2,733	1,104	160	225	17	517	710	0
Utah	377	210	48	43	0	51	25	0
Vermont	271	75	28	4	7	53	18	86
Virginia	1,305	529	40	18	2	367	179	170
Washington	2,888	1,023	16	124	87	659	321	658
West Virginia	1,903	372	17	5	3	710	181	615
Wisconsin	1,639	548	30	52	7	161	658	183
Wyoming	36	30	1	1	0	2	2	0
American Samoa	40	15	0	0	0	7	18	0
Guam	19	8	0	2	1	6	2	0
Mariana Islands	62	11	1	0	0	34	16	0
Puerto Rico	1,634	306	3	26	14	919	346	20
Trust Territories	96	47	1	0	0	33	15	0
Virgin Islands	25	11	0	1	0	9	4	0
TOTAL	$85,039	$23,622	$4,076	$2,821	$3,172	$18,018	$10,723	$23,207

Levels of Reliability for Current 1984 Needs Eligible for Federal Financial Assistance Under the Clean Water Act

Tables A-2, A-3, and A-4 summarize the results of EPA's reliability analysis of the Needs Survey data for the current 1984 needs. Each table breaks down the needs estimate into the following three levels of reliability:

- Reliability Level 1: Needs based on specific facility planning documents. This includes estimates for facilities both with and without current works in operation.
- Reliability Level 2: Needs based on construction cost curves for facilities that currently have some type of works in operation or under construction. No facility planning has been completed for the remaining needs.
- Reliability Level 3: Needs based on construction cost curves for facilities that currently have no works in operation or under construction. No facility planning has been completed.

The reliability analysis was performed to highlight the variations that exist among the individual need estimates used to produce the State and national totals.

Table A-2 summarizes the levels of reliability for the total current 1984 needs. Table A-3 summarizes the levels of reliability for Categories I (Secondary Treatment), II (Advanced Treatment), IIIA (Infiltration/Inflow), and IVB (New Interceptor Sewers), the categories of need that are fully eligible for Federal financial assistance under the Clean Water Act. Table A-4 summarizes the levels of reliability for Categories IIIB (Replacement/Rehabilitation), IVA (New Collector Sewers), and V (Combined Sewer Overflows), the categories that have limited eligibility.

TABLE A-2

LEVELS OF RELIABILITY FOR TOTAL CURRENT 1984 NEEDS ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE UNDER THE CLEAN WATER ACT

(January 1984 dollars in millions)

	Total	Reliability Level		
		1	2	3
Alabama	$ 811	$ 411	$ 220	$ 180
Alaska	166	71	74	21
Arizona	533	294	102	137
Arkansas	345	121	111	113
California	4,140	2,412	1,016	712
Colorado	147	84	44	19
Connecticut	1,709	862	640	207
Delaware	274	43	204	27
Dist. of Columbia	299	299	0	0
Florida	2,885	1,661	746	478
Georgia	989	645	211	133
Hawaii	369	142	142	85
Idaho	218	102	86	30
Illinois	3,906	3,726	130	50
Indiana	1,978	427	1,387	164
Iowa	950	604	272	74
Kansas	654	335	303	16
Kentucky	1,317	608	513	196
Louisiana	980	585	140	255
Maine	884	302	512	70
Maryland	1,108	861	124	123
Massachusetts	4,539	3,129	1,230	180
Michigan	3,131	1,957	971	203
Minnesota	1,274	1,087	136	51
Mississippi	509	326	65	118
Missouri	2,784	2,141	550	93
Montana	61	46	5	10
Nebraska	174	128	40	6
Nevada	94	56	5	33
New Hampshire	1,003	406	351	246
New Jersey	4,562	2,717	1,560	285
New Mexico	99	50	11	38
New York	14,701	10,961	1,927	1,813
North Carolina	1,037	616	288	133
North Dakota	23	18	4	1
Ohio	4,400	2,364	1,743	293
Oklahoma	395	233	105	57
Oregon	974	416	529	29
Pennsylvania	4,319	653	2,175	1,491
Rhode Island	754	634	62	58
South Carolina	732	439	194	99
South Dakota	96	42	44	10
Tennessee	1,688	707	847	134
Texas	2,733	1,528	523	682
Utah	377	247	46	84
Vermont	271	141	105	25
Virginia	1,305	513	344	448
Washington	2,888	2,100	562	226
West Virginia	1,903	523	669	711
Wisconsin	1,639	1,425	113	101
Wyoming	36	25	7	4
American Samoa	40	40	0	0
Guam	19	19	0	0
Mariana Islands	62	10	30	22
Puerto Rico	1,634	849	785	0
Trust Territories	96	44	24	28
Virgin Islands	25	14	11	0
TOTAL	$85,039	$51,199	$23,038	$10,802

TABLE A-3

LEVELS OF RELIABILITY FOR CURRENT 1984 NEEDS IN CATEGORIES I, II, IIIA, AND IVB ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE UNDER THE CLEAN WATER ACT

(January 1984 dollars in millions)

	Total	Reliability Level 1	Reliability Level 2	Reliability Level 3
Alabama	$ 506	$ 352	$ 90	$ 64
Alaska	139	63	67	9
Arizona	382	278	28	76
Arkansas	241	102	67	72
California	1,954	1,326	263	365
Colorado	112	83	20	9
Connecticut	677	354	126	197
Delaware	57	29	9	19
Dist. of Columbia	269	269	0	0
Florida	1,648	1,407	164	77
Georgia	564	482	27	55
Hawaii	128	65	27	36
Idaho	114	87	9	18
Illinois	1,185	1,124	42	19
Indiana	518	357	79	82
Iowa	671	580	57	34
Kansas	293	218	65	10
Kentucky	625	476	54	95
Louisiana	582	371	96	115
Maine	286	215	33	38
Maryland	805	669	71	65
Massachusetts	2,193	2,031	95	67
Michigan	1,809	1,599	137	73
Minnesota	622	547	46	29
Mississippi	403	288	42	73
Missouri	1,240	1,135	54	51
Montana	34	25	4	5
Nebraska	135	112	19	4
Nevada	72	51	4	17
New Hampshire	482	264	50	168
New Jersey	3,020	2,505	276	239
New Mexico	62	39	4	19
New York	4,545	3,230	337	978
North Carolina	599	481	74	44
North Dakota	11	7	3	1
Ohio	2,331	1,877	331	123
Oklahoma	298	203	57	38
Oregon	246	202	29	15
Pennsylvania	1,752	446	503	803
Rhode Island	223	184	19	20
South Carolina	455	400	19	36
South Dakota	68	39	20	9
Tennessee	657	579	41	37
Texas	2,198	1,461	351	386
Utah	326	239	41	46
Vermont	125	106	6	13
Virginia	768	407	62	299
Washington	1,485	1,308	110	67
West Virginia	574	242	34	298
Wisconsin	1,287	1,211	42	34
Wyoming	33	24	7	2
American Samoa	33	33	0	0
Guam	12	12	0	0
Mariana Islands	28	10	16	2
Puerto Rico	682	626	56	0
Trust Territories	63	29	20	14
Virgin Islands	15	13	2	0
TOTAL	$40,642	$30,872	$4,305	$5,465

TABLE A-4

LEVELS OF RELIABILITY FOR CURRENT 1984 NEEDS IN CATEGORIES IIIB, IVA, AND V ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE UNDER THE CLEAN WATER ACT

(January 1984 dollars in millions)

	Total	Reliability Level 1	Reliability Level 2	Reliability Level 3
Alabama	$ 304	$ 59	$ 130	$ 115
Alaska	26	8	6	12
Arizona	150	15	74	61
Arkansas	103	18	44	41
California	2,186	1,086	752	348
Colorado	35	1	24	10
Connecticut	1,031	507	514	10
Delaware	218	15	195	8
Dist. of Columbia	31	31	0	0
Florida	1,237	254	581	402
Georgia	425	162	185	78
Hawaii	240	76	115	49
Idaho	104	23	69	12
Illinois	2,719	2,601	88	30
Indiana	1,460	70	1,308	82
Iowa	279	24	215	40
Kansas	360	116	238	6
Kentucky	694	131	459	104
Louisiana	407	214	44	149
Maine	599	87	480	32
Maryland	302	191	53	58
Massachusetts	2,347	1,099	1,135	113
Michigan	1,321	363	829	129
Minnesota	654	541	91	22
Mississippi	106	38	23	45
Missouri	1,544	1,006	496	42
Montana	25	20	1	4
Nebraska	38	16	21	1
Nevada	24	6	2	16
New Hampshire	521	142	301	78
New Jersey	1,543	212	1,284	47
New Mexico	36	10	7	19
New York	10,157	7,731	1,591	835
North Carolina	437	134	214	89
North Dakota	12	11	1	0
Ohio	2,069	487	1,413	169
Oklahoma	98	32	48	18
Oregon	730	215	500	15
Pennsylvania	2,566	207	1,672	687
Rhode Island	530	449	43	38
South Carolina	276	38	175	63
South Dakota	28	3	24	1
Tennessee	1,031	128	806	97
Texas	534	67	172	295
Utah	51	8	6	37
Vermont	146	34	99	13
Virginia	538	107	282	149
Washington	1,404	792	452	160
West Virginia	1,328	280	635	413
Wisconsin	350	212	71	67
Wyoming	2	1	0	1
American Samoa	7	7	0	0
Guam	6	6	0	0
Mariana Islands	34	0	14	20
Puerto Rico	952	223	729	0
Trust Territories	33	14	5	14
Virgin Islands	9	0	9	0
TOTAL	$44,397	$20,328	$18,725	$5,344

Future Year 2000 Publicly Owned Wastewater Treatment Needs Eligible for Federal Financial Assistance Under the Clean Water Act

Table A-5 summarizes EPA's assessment of needs for the year 2000 population. All needs listed in this table have been adjusted to reflect the section 204(a)(5) reserve capacity limitations of the Clean Water Act. Each facility not affected by the grandfathering provisions of the Act was limited to its projected 1990 capacity. All values are given in millions of 1984 dollars.

The future year 2000 needs represent the capital investment necessary to build all publicly owned wastewater treatment facilities needed for compliance with the requirements of the Clean Water Act through the year 2000. This is the capital investment necessary to provide adequate wastewater treatment facilities for the present 1984 population plus population growth and migration for the next 16 years. The assessment includes all planning, design, and construction activities considered eligible for Federal financial assistance under the Clean Water Act. All ineligible project costs, including that amount necessary to provide reserve capacity needed after 1990 for nongrandfathered facilities, are excluded from the assessment. The needs for Categories I, II, and IVB have been reduced to reflect the reserve capacity limitations.

TABLE A-5

FUTURE YEAR 2000 PUBLICLY OWNED WASTEWATER TREATMENT NEEDS ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE UNDER THE CLEAN WATER ACT

(January 1984 dollars in millions)

		Category of Need						
	Total	I	II	IIIA	IIIB	IVA	IVB	V
Alabama	$1,068	$ 282	$ 84	$ 89	$ 2	$ 366	$ 245	$ 0
Alaska	291	140	0	5	0	21	119	6
Arizona	804	375	69	10	1	211	138	0
Arkansas	572	261	48	30	2	139	92	0
California	6,313	2,318	117	339	468	1,708	849	514
Colorado	390	222	20	5	1	27	100	15
Connecticut	1,888	432	76	17	20	717	185	441
Delaware	299	26	2	5	5	40	39	182
Dist. of Columbia	299	97	171	0	0	0	0	31
Florida	4,533	1,352	290	117	18	1,656	1,097	3
Georgia	1,443	352	191	67	15	338	311	169
Hawaii	582	148	0	0	19	322	93	0
Idaho	354	137	11	6	3	130	59	8
Illinois	4,204	707	300	166	38	190	281	2,522
Indiana	2,142	353	130	21	3	286	134	1,215
Iowa	1,094	431	92	63	2	125	215	166
Kansas	862	173	1	20	22	109	285	252
Kentucky	1,794	316	105	80	6	636	450	201
Louisiana	1,388	466	25	85	18	461	333	0
Maine	932	166	2	22	10	233	112	387
Maryland	1,446	272	595	57	57	254	186	25
Massachusetts	4,696	1,404	116	35	20	935	733	1,453
Michigan	3,612	1,250	267	39	97	580	649	730
Minnesota	1,562	474	132	19	20	151	252	514
Mississippi	698	268	84	59	1	125	161	0
Missouri	3,211	1,049	4	49	272	307	505	1,025
Montana	82	20	2	1	1	26	31	1
Nebraska	292	177	0	1	1	29	68	16
Nevada	183	84	38	3	3	29	26	0
New Hampshire	1,123	240	8	9	5	339	298	224
New Jersey	4,684	2,257	144	180	78	341	508	1,176
New Mexico	196	108	1	0	1	43	43	0
New York	15,184	3,267	239	186	1,507	2,683	1,175	6,127
North Carolina	1,570	283	106	97	1	546	536	1
North Dakota	45	23	0	0	0	6	8	8
Ohio	4,834	781	581	99	233	708	1,193	1,239
Oklahoma	593	252	79	13	11	112	126	0
Oregon	1,230	147	27	78	18	331	185	444
Pennsylvania	4,749	1,307	295	14	3	1,376	324	1,430
Rhode Island	781	132	13	1	39	187	93	316
South Carolina	1,226	317	50	75	0	379	405	0
South Dakota	141	67	20	1	1	4	24	24
Tennessee	2,211	424	97	157	12	535	376	610
Texas	4,145	1,663	233	225	17	722	1,285	0
Utah	567	319	73	43	0	76	56	0
Vermont	283	76	29	4	7	62	19	86
Virginia	1,549	604	66	18	2	463	226	170
Washington	3,365	1,037	18	124	87	808	633	658
West Virginia	1,996	390	20	5	3	764	199	615
Wisconsin	1,821	616	33	52	7	220	710	183
Wyoming	54	34	8	1	0	2	9	0
American Samoa	40	15	0	0	0	7	18	0
Guam	41	23	0	2	1	7	8	0
Mariana Islands	82	13	1	0	0	51	17	0
Puerto Rico	2,085	394	4	26	14	1,252	375	20
Trust Territories	117	59	1	0	0	35	22	0
Virgin Islands	48	16	0	1	0	21	10	0
TOTAL	$101,794	$28,616	$5,118	$2,821	$3,172	$22,231	$16,629	$23,207

Levels of Reliability for Future Year 2000 Needs Eligible for Federal Financial Assistance Under the Clean Water Act

Tables A-6, A-7, and A-8 summarize the results of EPA's reliability analysis of the eligible year 2000 Needs Survey data. All needs listed in this table have been adjusted to reflect the section 204(a)(5) reserve capacity limitations of the Clean Water Act. Each table breaks down the needs estimate into the following three levels of reliability:

- Reliability Level 1: Needs based on specific facility planning documents. This includes estimates for facilities both with and without current works in operation.
- Reliability Level 2: Needs based on construction cost curves for facilities that currently have some type of works in operation or under construction. No facility planning has been completed for the remaining needs.
- Reliability Level 3: Needs based on construction cost curves for facilities that currently have no works in operation or under construction. No facility planning has been completed.

The reliability analysis was performed to highlight the variations that exist among the individual need estimates used to produce the State and national totals.

Table A-6 summarizes the levels of reliability for the eligible year 2000 needs. Table A-7 summarizes the levels of reliability for Categories I (Secondary Treatment), II (Advanced Treatment), IIIA (Infiltration/Inflow), and IVB (New Interceptor Sewers), the categories of need that are fully eligible for Federal financial assistance under the Clean Water Act. Table A-8 summarizes the levels of reliability for Categories IIIB (Replacement/Rehabilitation), IVA (New Collector Sewers), and V (Combined Sewer Overflows), the categories of need that have limited eligibility.

TABLE A-6

LEVELS OF RELIABILITY FOR FUTURE YEAR 2000 NEEDS ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE UNDER THE CLEAN WATER ACT

(January 1984 dollars in millions)

	Total	Reliability Level		
		1	2	3
Alabama	$1,068	$ 592	$ 278	$ 198
Alaska	291	149	117	25
Arizona	804	472	162	170
Arkansas	572	266	172	134
California	6,313	3,507	1,888	918
Colorado	390	248	117	25
Connecticut	1,888	889	790	209
Delaware	299	53	217	29
Dist. of Columbia	299	299	0	0
Florida	4,533	2,711	1,130	692
Georgia	1,443	959	312	172
Hawaii	582	247	213	122
Idaho	354	189	128	37
Illinois	4,204	3,992	151	61
Indiana	2,142	512	1,439	191
Iowa	1,094	656	363	75
Kansas	862	420	417	25
Kentucky	1,794	924	639	231
Louisiana	1,388	886	174	328
Maine	932	323	538	71
Maryland	1,446	1,000	309	137
Massachusetts	4,696	3,247	1,262	187
Michigan	3,612	2,204	1,154	254
Minnesota	1,562	1,326	178	58
Mississippi	698	459	96	143
Missouri	3,211	2,480	621	110
Montana	82	62	9	11
Nebraska	292	193	93	6
Nevada	183	112	26	45
New Hampshire	1,123	484	375	264
New Jersey	4,684	2,844	1,561	279
New Mexico	196	134	17	45
New York	15,184	11,189	1,993	2,002
North Carolina	1,570	1,018	390	162
North Dakota	45	35	9	1
Ohio	4,834	2,649	1,846	339
Oklahoma	593	376	150	67
Oregon	1,230	577	616	37
Pennsylvania	4,749	711	2,341	1,697
Rhode Island	781	652	67	62
South Carolina	1,226	828	277	121
South Dakota	141	83	48	10
Tennessee	2,211	1,035	1,008	168
Texas	4,145	1,998	1,251	896
Utah	567	345	116	106
Vermont	283	145	109	29
Virginia	1,549	593	445	511
Washington	3,365	2,182	881	302
West Virginia	1,996	561	681	754
Wisconsin	1,821	1,536	151	134
Wyoming	54	42	8	4
American Samoa	40	40	0	0
Guam	41	41	0	0
Mariana Islands	82	17	33	32
Puerto Rico	2,085	993	1,092	0
Trust Territories	117	47	38	32
Virgin Islands	48	33	15	0
TOTAL	$101,794	$60,565	$28,511	$12,718

TABLE A-7

LEVELS OF RELIABILITY FOR FUTURE YEAR 2000 NEEDS IN CATEGORIES I, II, IIIA, AND IVB ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE UNDER THE CLEAN WATER ACT

(January 1984 dollars in millions)

	Total	Reliability Level		
		1	2	3
Alabama	$ 700	$ 527	$ 113	$ 60
Alaska	264	140	111	13
Arizona	592	455	55	82
Arkansas	431	247	108	76
California	3,623	2,419	780	424
Colorado	347	248	88	11
Connecticut	710	374	140	196
Delaware	72	36	16	20
Dist. of Columbia	269	269	0	0
Florida	2,855	2,423	340	92
Georgia	921	793	67	61
Hawaii	242	148	44	50
Idaho	212	163	29	20
Illinois	1,454	1,383	50	21
Indiana	638	441	109	88
Iowa	801	632	136	33
Kansas	479	302	159	18
Kentucky	951	789	69	93
Louisiana	909	669	113	127
Maine	302	229	38	35
Maryland	1,110	801	242	67
Massachusetts	2,288	2,119	108	61
Michigan	2,206	1,824	304	78
Minnesota	877	785	62	30
Mississippi	572	420	68	84
Missouri	1,608	1,468	84	56
Montana	54	42	7	5
Nebraska	245	177	64	4
Nevada	151	106	24	21
New Hampshire	555	334	59	162
New Jersey	3,090	2,614	254	222
New Mexico	152	123	8	21
New York	4,867	3,432	370	1,065
North Carolina	1,022	881	96	45
North Dakota	30	21	8	1
Ohio	2,654	2,157	372	125
Oklahoma	470	344	85	41
Oregon	436	342	78	16
Pennsylvania	1,941	488	597	856
Rhode Island	238	202	16	20
South Carolina	848	775	38	35
South Dakota	111	78	24	9
Tennessee	1,055	902	113	40
Texas	3,406	1,930	1,004	472
Utah	492	335	106	51
Vermont	128	110	7	11
Virginia	914	483	116	315
Washington	1,812	1,387	349	76
West Virginia	614	276	41	297
Wisconsin	1,411	1,319	52	40
Wyoming	51	40	8	3
American Samoa	33	33	0	0
Guam	33	33	0	0
Mariana Islands	31	18	12	1
Puerto Rico	799	747	52	0
Trust Territories	82	33	33	16
Virgin Islands	26	24	2	0
TOTAL	$53,184	$39,890	$7,428	$5,866

TABLE A-8

LEVELS OF RELIABILITY FOR FUTURE YEAR 2000 NEEDS IN CATEGORIES IIIB, IVA, AND V ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE UNDER THE CLEAN WATER ACT

(January 1984 dollars in millions)

	Total	Reliability Level		
		1	2	3
Alabama	$ 368	$ 66	$ 164	$ 138
Alaska	27	8	7	12
Arizona	211	17	107	87
Arkansas	142	19	65	58
California	2,692	1,090	1,108	494
Colorado	44	1	29	14
Connecticut	1,178	515	650	13
Delaware	227	17	201	9
Dist. of Columbia	31	31	0	0
Florida	1,677	286	790	601
Georgia	522	166	245	111
Hawaii	341	100	169	72
Idaho	141	25	99	17
Illinois	2,750	2,609	101	40
Indiana	1,504	71	1,330	103
Iowa	293	24	227	42
Kansas	384	118	259	7
Kentucky	843	135	570	138
Louisiana	479	216	61	202
Maine	630	95	500	35
Maryland	336	198	68	70
Massachusetts	2,408	1,128	1,154	126
Michigan	1,407	381	850	176
Minnesota	686	542	116	28
Mississippi	125	39	28	58
Missouri	1,604	1,013	537	54
Montana	28	20	2	6
Nebraska	47	17	28	2
Nevada	32	6	2	24
New Hampshire	568	149	317	102
New Jersey	1,595	231	1,307	57
New Mexico	43	10	9	24
New York	10,317	7,757	1,623	937
North Carolina	550	140	293	117
North Dakota	14	13	1	0
Ohio	2,180	492	1,474	214
Oklahoma	123	32	65	26
Oregon	793	234	538	21
Pennsylvania	2,809	223	1,744	842
Rhode Island	542	449	51	42
South Carolina	379	54	239	86
South Dakota	28	3	24	1
Tennessee	1,157	135	894	128
Texas	739	67	248	424
Utah	76	11	9	56
Vermont	154	34	102	18
Virginia	634	109	329	196
Washington	1,552	794	532	226
West Virginia	1,381	284	640	457
Wisconsin	410	216	100	94
Wyoming	2	1	0	1
American Samoa	7	7	0	0
Guam	8	8	0	0
Mariana Islands	51	0	21	30
Puerto Rico	1,285	245	1,040	0
Trust Territories	35	14	5	16
Virgin Islands	21	8	13	0
TOTAL	$48,610	$20,673	$21,085	$6,852

Future Year 2000 Publicly Owned Wastewater Treatment Needs Unrestricted by the Reserve Capacity Limitations of the Clean Water Act

Table A-9 summarizes EPA's assessment of needs for the total year 2000 population. The needs estimates are not restricted by any limitations on reserve capacity. All values are given in millions of 1984 dollars.

The total year 2000 needs represent the capital investment necessary to build all publicly owned wastewater treatment facilities needed for compliance with the requirements of the Clean Water Act through the year 2000. These are the funds necessary to provide adequate wastewater treatment systems for the present 1984 population, plus population growth and migration for the next 16 years. The assessment includes all planning, design, and construction activities considered eligible for funding under the Clean Water Act. All ineligible project costs are excluded from the assessment.

TABLE A-9

FUTURE YEAR 2000 PUBLICLY OWNED WASTEWATER TREATMENT NEEDS UNRESTRICTED BY THE RESERVE CAPACITY LIMITATIONS OF THE CLEAN WATER ACT

(January 1984 dollars in millions)

		Category of Need						
	Total	I	II	IIIA	IIIB	IVA	IVB	V
Alabama	$1,220	$ 371	$ 109	$ 89	$ 2	$ 366	$ 283	$ 0
Alaska	349	175	0	5	0	21	142	6
Arizona	931	457	71	10	1	211	181	0
Arkansas	638	301	53	30	2	139	113	0
California	6,674	2,574	139	339	468	1,708	932	514
Colorado	461	270	25	5	1	27	118	15
Connecticut	1,968	466	89	17	20	717	218	441
Delaware	303	27	2	5	5	40	42	182
Dist. of Columbia	299	97	171	0	0	0	0	31
Florida	5,362	1,803	349	117	18	1,656	1,416	3
Georgia	1,652	449	213	67	15	338	401	169
Hawaii	636	188	0	0	19	322	107	0
Idaho	385	158	12	6	3	130	68	8
Illinois	4,344	794	321	166	38	190	313	2,522
Indiana	2,200	394	136	21	3	286	145	1,215
Iowa	1,161	477	97	63	2	125	231	166
Kansas	953	225	1	20	22	109	324	252
Kentucky	1,960	372	114	80	6	636	551	201
Louisiana	1,598	596	30	85	18	461	408	0
Maine	971	187	2	22	10	233	130	387
Maryland	1,538	302	610	57	57	254	233	25
Massachusetts	4,928	1,480	121	35	20	935	884	1,453
Michigan	3,729	1,322	280	39	97	580	681	739
Minnesota	1,622	511	136	19	20	151	271	514
Mississippi	805	335	96	59	1	125	189	0
Missouri	3,398	1,138	5	49	272	307	602	1,025
Montana	87	23	2	1	1	26	33	1
Nebraska	309	191	0	1	1	29	71	16
Nevada	196	92	38	3	3	29	31	0
New Hampshire	1,211	283	8	9	5	339	343	224
New Jersey	4,934	2,433	166	180	78	341	560	1,176
New Mexico	208	115	1	0	1	43	48	0
New York	15,489	3,441	266	186	1,507	2,683	1,279	6,127
North Carolina	1,744	351	119	97	1	546	629	1
North Dakota	47	25	0	0	0	6	8	8
Ohio	5,075	913	617	99	233	708	1,266	1,239
Oklahoma	655	293	86	13	11	112	140	0
Oregon	1,272	160	29	78	18	331	212	444
Pennsylvania	4,955	1,449	316	14	3	1,376	367	1,430
Rhode Island	801	145	14	1	39	187	99	316
South Carolina	1,424	402	58	75	0	379	510	0
South Dakota	150	73	20	1	1	4	27	24
Tennessee	2,414	507	117	157	12	535	476	610
Texas	4,770	2,029	267	225	17	722	1,510	0
Utah	718	419	92	43	0	76	88	0
Vermont	287	79	30	4	7	62	19	86
Virginia	1,670	659	80	18	2	463	278	170
Washington	3,781	1,277	23	124	87	808	804	658
West Virginia	2,084	444	22	5	3	764	231	615
Wisconsin	1,876	637	37	52	7	220	740	183
Wyoming	66	43	8	1	0	2	12	0
American Samoa	62	25	0	0	0	7	30	0
Guam	42	24	0	2	1	7	8	0
Mariana Islands	99	17	1	0	0	51	30	0
Puerto Rico	2,219	470	6	26	14	1,252	431	20
Trust Territories	133	69	1	0	0	35	28	0
Virgin Islands	49	17	0	1	0	21	10	0
TOTAL	$108,912	$32,574	$5,606	$2,821	$3,172	$22,231	$19,301	$23,207

Levels of Reliability for Future Year 2000 Needs Unrestricted by the Reserve Capacity Limitations of the Clean Water Act

Tables A-10, A-11, and A-12 summarize the results of EPA's reliability analysis of the Needs Survey data for the total year 2000 needs. The tables address the reliability of the total year 2000 needs, unrestricted by any limitations on reserve capacity. Each table breaks down the needs estimate into three levels of reliability as follows:

- Reliability Level 1: Needs based on specific facility planning documents. This includes estimates for facilities both with and without current works in operation.
- Reliability Level 2: Needs based on construction cost curves for facilities that currently have some type of works in operation or under construction. No facility planning has been completed for the remaining needs.
- Reliability Level 3: Needs based on construction cost curves for facilities that currently have no works in operation or under construction. No facility planning has been completed.

The reliability analysis was performed to highlight the variations that exist among the individual need estimates used to produce the State and national totals.

Table A-10 summarizes the levels of reliability for the total year 2000 needs. Table A-11 summarizes the levels of reliability for Categories I (Secondary Treatment), II (Advanced Treatment), IIIA (Infiltration/Inflow), and IVB (New Interceptor Sewers), the categories of need that are fully eligible for Federal financial assistance under the Clean Water Act. Table A-12 summarizes the levels of reliability for Categories IIIB (Replacement/Rehabilitation), IVA (New Collector Sewers), and V (Combined Sewer Overflows), the categories that have limited eligibility.

TABLE A-10

LEVELS OF RELIABILITY FOR FUTURE YEAR 2000 NEEDS UNRESTRICTED BY THE RESERVE CAPACITY LIMITATIONS OF THE CLEAN WATER ACT

(January 1984 dollars in millions)

	Total	Reliability Level 1	Reliability Level 2	Reliability Level 3
Alabama	$1,220	$ 700	$ 296	$ 224
Alaska	349	167	153	29
Arizona	931	567	177	187
Arkansas	638	308	185	145
California	6,674	3,632	2,059	983
Colorado	461	277	156	28
Connecticut	1,968	953	806	209
Delaware	303	56	218	29
Dist. of Columbia	299	299	0	0
Florida	5,362	3,350	1,276	736
Georgia	1,652	1,123	337	192
Hawaii	636	266	224	146
Idaho	385	209	134	42
Illinois	4,344	4,120	160	64
Indiana	2,200	541	1,451	208
Iowa	1,161	709	374	78
Kansas	953	475	444	34
Kentucky	1,960	1,066	644	250
Louisiana	1,598	1,013	235	350
Maine	971	342	553	76
Maryland	1,538	1,071	324	143
Massachusetts	4,928	3,424	1,295	209
Michigan	3,729	2,289	1,176	264
Minnesota	1,622	1,378	185	59
Mississippi	805	517	114	174
Missouri	3,398	2,636	644	118
Montana	87	66	9	12
Nebraska	309	198	104	7
Nevada	196	116	31	49
New Hampshire	1,211	519	388	304
New Jersey	4,934	3,044	1,594	296
New Mexico	208	141	19	48
New York	15,489	11,358	2,073	2,058
North Carolina	1,744	1,146	426	172
North Dakota	47	36	10	1
Ohio	5,075	2,814	1,910	351
Oklahoma	655	413	167	75
Oregon	1,272	606	626	40
Pennsylvania	4,955	732	2,443	1,780
Rhode Island	801	669	70	62
South Carolina	1,424	1,016	277	131
South Dakota	150	87	52	11
Tennessee	2,414	1,216	1,021	177
Texas	4,770	2,232	1,513	1,025
Utah	718	445	146	127
Vermont	287	144	110	33
Virginia	1,670	659	476	535
Washington	3,781	2,489	969	323
West Virginia	2,084	609	686	789
Wisconsin	1,876	1,567	167	142
Wyoming	66	53	9	4
American Samoa	62	62	0	0
Guam	42	42	0	0
Mariana Islands	99	19	47	33
Puerto Rico	2,219	1,110	1,109	0
Trust Territories	133	60	39	34
Virgin Islands	49	33	16	0
TOTAL	$108,912	$65,189	$30,127	$13,596

TABLE A-11

LEVELS OF RELIABILITY FOR FUTURE YEAR 2000 NEEDS IN CATEGORIES I, II, IIIA, AND IVB UNRESTRICTED BY THE RESERVE CAPACITY LIMITATIONS OF THE CLEAN WATER ACT

(January 1984 dollars in millions)

	Total	Reliability Level 1	Reliability Level 2	Reliability Level 3
Alabama	$ 851	$ 633	$ 132	$ 86
Alaska	322	158	147	17
Arizona	720	551	69	100
Arkansas	495	288	120	87
California	3,985	2,543	953	489
Colorado	418	277	127	14
Connecticut	791	438	156	197
Delaware	76	39	17	20
Dist. of Columbia	269	269	0	0
Florida	3,685	3,064	486	135
Georgia	1,130	958	91	81
Hawaii	296	166	56	74
Idaho	244	183	36	25
Illinois	1,593	1,510	59	24
Indiana	696	471	121	104
Iowa	868	684	148	36
Kansas	570	358	185	27
Kentucky	1,116	929	75	112
Louisiana	1,119	796	174	149
Maine	342	258	43	41
Maryland	1,202	873	256	73
Massachusetts	2,520	2,296	141	83
Michigan	2,323	1,908	327	88
Minnesota	937	837	69	31
Mississippi	679	477	86	116
Missouri	1,795	1,624	107	64
Montana	59	45	8	6
Nebraska	263	182	76	5
Nevada	168	110	33	25
New Hampshire	642	369	71	202
New Jersey	3,339	2,813	287	239
New Mexico	164	130	10	24
New York	5,173	3,602	450	1,121
North Carolina	1,195	1,008	133	54
North Dakota	33	22	10	1
Ohio	2,895	2,322	436	137
Oklahoma	532	382	102	48
Oregon	479	372	88	19
Pennsylvania	2,147	510	699	938
Rhode Island	258	219	19	20
South Carolina	1,045	960	40	45
South Dakota	121	83	28	10
Tennessee	1,257	1,081	127	49
Texas	4,030	2,164	1,265	601
Utah	642	434	137	71
Vermont	131	110	7	14
Virginia	1,035	549	146	340
Washington	2,228	1,695	436	97
West Virginia	701	323	46	332
Wisconsin	1,465	1,351	67	47
Wyoming	63	51	9	3
American Samoa	55	55	0	0
Guam	34	34	0	0
Mariana Islands	49	19	27	3
Puerto Rico	932	863	69	0
Trust Territories	98	46	34	18
Virgin Islands	27	24	3	0
TOTAL	$60,302	$44,516	$9,044	$6,742

TABLE A-12

LEVELS OF RELIABILITY FOR FUTURE YEAR 2000 NEEDS IN CATEGORIES IIIB, IVA, AND V UNRESTRICTED BY THE RESERVE CAPACITY LIMITATIONS OF THE CLEAN WATER ACT

(January 1984 dollars in millions)

	Total	Reliability Level		
		1	2	3
Alabama	$ 368	$ 66	$ 164	$ 138
Alaska	27	8	7	12
Arizona	215	21	107	87
Arkansas	142	19	65	58
California	2,692	1,090	1,108	494
Colorado	44	1	29	14
Connecticut	1,178	515	650	13
Delaware	227	17	201	9
Dist. of Columbia	31	31	0	0
Florida	1,677	286	790	601
Georgia	522	166	245	111
Hawaii	341	100	169	72
Idaho	141	25	99	17
Illinois	2,750	2,609	101	40
Indiana	1,504	71	1,330	103
Iowa	293	24	227	42
Kansas	384	118	259	7
Kentucky	843	135	570	138
Louisiana	479	216	61	202
Maine	630	95	500	35
Maryland	336	198	68	70
Massachusetts	2,408	1,128	1,154	126
Michigan	1,407	381	850	176
Minnesota	686	542	116	28
Mississippi	125	39	28	58
Missouri	1,604	1,013	537	54
Montana	28	20	2	6
Nebraska	47	17	28	2
Nevada	32	6	2	24
New Hampshire	568	149	317	102
New Jersey	1,595	231	1,307	57
New Mexico	43	10	9	24
New York	10,317	7,757	1,623	937
North Carolina	546	136	293	117
North Dakota	14	13	1	0
Ohio	2,180	492	1,474	214
Oklahoma	123	32	65	26
Oregon	793	234	538	21
Pennsylvania	2,809	223	1,744	842
Rhode Island	542	449	51	42
South Carolina	379	54	239	86
South Dakota	28	3	24	1
Tennessee	1,157	135	894	128
Texas	739	67	248	424
Utah	76	11	9	56
Vermont	154	34	102	18
Virginia	634	109	329	196
Washington	1,552	794	532	226
West Virginia	1,381	284	640	457
Wisconsin	410	216	100	94
Wyoming	2	1	0	1
American Samoa	7	7	0	0
Guam	8	8	0	0
Mariana Islands	51	0	21	30
Puerto Rico	1,285	245	1,040	0
Trust Territorries	35	14	5	16
Virgin Islands	21	8	13	0
TOTAL	$48,610	$20,673	$21,085	$6,852

Unadjusted Needs to Control or Correct Combined Sewer Overflows (Category V)

Table A-13 presents the unadjusted assessment of eligible needs for the control or correction of combined sewer overflows. To improve their reliability, these estimates have been adjusted to reflect recent facilities planning experience, including the discrepancy between higher urban and lower nonurban costs. The adjusted CSO estimates can be found in Table A-14.

Presented in this table is a State-by-State summary of the three components of the 1984 Category V need prior to adjustment: urban, nonurban, and other. These estimates represent an update of the 1982 needs based on the application of an inflation factor and new information provided by individual States. The unadjusted urban component includes the rule-of-thumb needs estimates for all combined sewer facilities located within an urban area, where a central city population of at least 50,000 is surrounded by closely settled areas. The unadjusted nonurban component includes the rule-of-thumb needs estimates for the combined sewers not located within urban areas. The "Other" component includes all Category V needs estimates based on facilities plans or other State planning documents. All costs are in millions of 1984 dollars. States without Category V needs are not shown.

TABLE A-13

UNADJUSTED NEEDS TO CONTROL OR CORRECT COMBINED SEWER OVERFLOWS
(CATEGORY V)

(January 1984 dollars in millions)

	Urban Unadjusted	Nonurban Unadjusted	Other	Total CSO Unadjusted
Alaska	$ 0	$ 21	$ 0	$ 21
California	0	0	514	514
Colorado	6	41	0	47
Connecticut	282	43	268	593
Delaware	305	26	0	331
Dist. of Columbia	0	0	31	31
Florida	0	12	0	12
Georgia	30	6	150	186
Idaho	0	21	2	23
Illinois	2	143	2,479	2,624
Indiana	1,595	894	43	2,532
Iowa	92	391	0	483
Kansas	339	5	57	401
Kentucky	131	422	3	556
Maine	398	506	13	917
Maryland	0	67	6	73
Massachusetts	1,482	325	516	2,323
Michigan	1,079	167	65	1,311
Minnesota	9	32	500	541
Missouri	558	32	697	1,287
Montana	0	1	0	1
Nebraska	0	9	13	22
New Hampshire	289	120	24	433
New Jersey	1,752	397	59	2,208
New York	1,046	1,405	5,122	7,573
North Carolina	0	3	0	3
North Dakota	0	0	8	8
Ohio	1,587	830	91	2,508
Oregon	718	23	27	768
Pennsylvania	2,086	813	1	2,900
Rhode Island	0	51	301	352
South Dakota	39	7	0	46
Tennessee	0	0	610	610
Vermont	0	294	0	294
Virginia	267	28	9	304
Washington	308	156	437	901
West Virginia	834	475	0	1,309
Wisconsin	0	32	174	206
Puerto Rico	0	0	20	20
TOTAL	$15,234	$7,798	$12,240	$35,272

Adjusted Combined Sewer Overflow Needs

Table A-14 presents the adjusted assessment of eligible needs for the control or correction of combined sewer overflows. To improve their reliability, the 1984 CSO needs estimates were adjusted to reflect recent facilities planning experience, including the discrepancy between higher urban and lower nonurban costs. The rule-of-thumb estimates were significantly higher than planning estimates. As a result, the urban and nonurban rule-of-thumb estimates were reduced by approximately 43 percent and 71 percent, respectively. The unadjusted CSO needs can be found in Table A-13.

Presented in this table is a State-by-State summary of the three components of the 1984 CSO need after adjustment: urban, nonurban, and other. Also, the total unadjusted and adjusted Category V estimates are presented for comparison. The adjusted urban component includes the adjusted rule-of-thumb needs estimates for all combined sewer facilities located within an urban area, where a central city population of at least 50,000 is surrounded by closely settled areas. The adjusted nonurban component includes the adjusted rule-of-thumb needs estimates for the combined sewers not located within urban areas. The "Other" component includes all CSO needs estimates based on facilities plans or other State planning documents; none of these estimates was adjusted. All costs are in millions of 1984 dollars. States without CSO needs are not shown.

TABLE A-14

ADJUSTED COMBINED SEWER OVERFLOW NEEDS

(January 1984 dollars in millions)

	Urban Adjusted	Nonurban Adjusted	Other	Total CSO Adjusted	Total CSO Unadjusted	Difference
Alaska	$ 0	$ 6	$ 0	$ 6	$ 21	$ 15
California	0	0	514	514	514	0
Colorado	3	12	0	15	47	32
Connecticut	161	12	268	441	593	152
Delaware	175	7	0	182	331	149
Dist. of Columbia	0	0	31	31	31	0
Florida	0	3	0	3	12	9
Georgia	17	2	150	169	186	17
Idaho	0	6	2	8	23	15
Illinois	1	42	2,479	2,522	2,624	102
Indiana	912	260	43	1,215	2,532	1,317
Iowa	52	114	0	166	483	317
Kansas	194	1	57	252	401	149
Kentucky	75	123	3	201	556	355
Maine	227	147	13	387	917	530
Maryland	0	19	6	25	73	48
Massachusetts	843	94	516	1,453	2,323	870
Michigan	616	49	65	730	1,311	581
Minnesota	5	9	500	514	541	27
Missouri	319	9	697	1,025	1,287	262
Montana	0	1	0	1	1	0
Nebraska	0	3	13	16	22	6
New Hampshire	165	35	24	224	433	209
New Jersey	1,002	115	59	1,176	2,208	1,032
New York	597	408	5,122	6,127	7,573	1,446
North Carolina	0	1	0	1	3	2
North Dakota	0	0	8	8	8	0
Ohio	906	242	91	1,239	2,508	1,269
Oregon	410	7	27	444	768	324
Pennsylvania	1,192	237	1	1,430	2,900	1,470
Rhode Island	0	15	301	316	352	36
South Dakota	22	2	0	24	46	22
Tennessee	0	0	610	610	610	0
Vermont	0	86	0	86	294	208
Virginia	153	8	9	170	304	134
Washington	176	45	437	658	901	243
West Virginia	477	138	0	615	1,309	694
Wisconsin	0	9	174	183	206	23
Puerto Rico	0	0	20	20	20	0
TOTAL	$8,700	$2,267	$12,240	$23,207	$35,272	$12,065

Adjusted Needs to Control or Correct Combined Sewer Overflows (Category V) by Basis of Estimate

Table A-15 presents the adjusted 1984 assessment of eligible needs for the control or correction of combined sewer overflows by basis of estimate. If an adequate State plan was available, it was used to establish the Category V need. Otherwise, Category V needs were established by a computerized rule-of-thumb approach based on one of four control levels: aesthetics, public health, fish and wildlife, and recreation. The control level chosen was a function of the designated receiving water use and is defined below. The rare exception occurred when the rule-of-thumb cost of sewer separation was less than the cost of the selected control level. In this case, the Category V needs for that facility were based on sewer separation. States without Category V needs are not shown.

Included in this table are the rule-of-thumb Category V estimates for the various levels of control. They are defined as follows:

- Asthetics: The pollutant control objectives are to remove floatables, coarse debris, and 40 percent of the annual biological oxygen demand (BOD) and suspended solids (SS) load generated by a combined sewer system. The use objectives of waters receiving this level of combined sewer discharges are navigation, and agricultural or industrial water supply.

- Public Health: The pollutant control objectives are based on the use of an optimum combination of CSO storage with pumping and chlorination to remove 90 percent of the fecal coliform bacteria. The use objectives of waters receiving this level of combined sewer discharges are domestic water supply, partial body contact recreation, and noncontact recreation.

- Fish and Wildlife: The pollutant control objectives are based on a cost-effective mix of CSO control technologies that provide from 40 to 90 percent removal of BOD and SS, depending on site-specific conditions. Control technologies considered include streetsweeping, combined sewer flushing, and storage/treatment systems. The use objectives of waters receiving this level of combined sewer discharges are warm water fisheries, cold water fisheries, and general fish and wildlife.

- Recreation: The pollutant control objectives are based on a cost-effective mix of CSO control technologies designed to kill 95 percent of the annual CSO fecal coliform load and to provide 40 to 90 percent removal of BOD and SS, depending on site-specific conditions. Control technologies considered include streetsweeping, combined sewer flushing, and storage/treatment systems. The use objectives of waters receiving this level of combined sewer discharges are general recreation, full body contact recreation and shellfish protection.

TABLE A-15

ADJUSTED NEEDS TO CONTROL OR CORRECT COMBINED SEWER OVERFLOWS (CATEGORY V) BY BASIS OF ESTIMATE

(January 1984 dollars in millions)

	Aesthetics	Public Health	Fish and Wildlife	Recreation	Sewer Separation	Planning	Total
Alaska	$0	$ 0	$ 0	$ 6	$ 0	$ 0	$ 6
California	0	0	0	0	0	514	514
Colorado	0	0	0	15	0	0	15
Connecticut	0	0	0	158	15	268	441
Delaware	0	0	0	178	4	0	182
Dist. of Columbia	0	0	0	0	0	31	31
Florida	0	0	0	3	0	0	3
Georgia	0	3	0	16	0	150	169
Idaho	0	0	0	4	2	2	8
Illinois	0	0	0	36	7	2,479	2,522
Indiana	0	0	944	218	10	43	1,215
Iowa	0	0	39	127	0	0	166
Kansas	0	0	195	0	0	57	252
Kentucky	0	0	0	198	0	3	201
Maine	0	0	147	63	164	13	387
Maryland	0	0	9	10	0	6	25
Massachusetts	0	0	14	917	6	516	1,453
Michigan	0	0	655	1	9	65	730
Minnesota	0	0	0	12	2	500	514
Missouri	1	0	88	239	0	697	1,025
Montana	0	0	0	1	0	0	1
Nebraska	0	0	0	3	0	13	16
New Hampshire	0	0	17	181	2	24	224
New Jersey	0	0	843	251	23	59	1,176
New York	0	726	20	224	35	5,122	6,127
North Carolina	0	0	1	0	0	0	1
North Dakota	0	0	0	0	0	8	8
Ohio	0	9	3	1,006	130	91	1,239
Oregon	0	0	0	415	2	27	444
Pennsylvania	0	0	1,381	36	12	1	1,430
Rhode Island	0	0	15	0	0	301	316
South Dakota	0	0	24	0	0	0	24
Tennessee	0	0	0	0	0	610	610
Vermont	0	0	8	62	16	0	86
Virginia	0	0	142	18	1	9	170
Washington	0	0	0	152	69	437	658
West Virginia	0	0	0	438	177	0	615
Wisconsin	0	0	0	9	0	174	183
Puerto Rico	0	0	0	0	0	20	20
TOTAL	$1	$738	$4,545	$4,997	$686	$12,240	$23,207

Adjusted Needs to Control or Correct Combined Sewer Overflows (Category V) by Receiving Water Type

Table A-16 presents the 1984 assessment of eligible needs for the control or correction of combined sewer overflows by the type of major water body receiving CSO discharges. This classification for streams, rivers, lakes, estuaries, and oceans is identified directly on the Needs Survey data collection form. States without Category V needs are not shown. For the purposes of this table, the definition of each receiving water type is as follows:

- Streams: A course of running water usually flowing in a particular direction in a definite channel with a mean depth less than 10 feet.
- River: A large stream of water that serves as the natural drainage channel with a mean depth equal to or greater than 10 feet.
- Lake: An inland body of water of considerable size occupying a hollow on the earth's surface.
- Estuary: A passage or inlet in which the tide meets a river current.
- Ocean: A nontidal body of salt water covering a large surface area of the globe.

TABLE A-16

ADJUSTED NEEDS TO CONTROL OR CORRECT COMBINED SEWER OVERFLOWS (CATEGORY V) BY RECEIVING WATER TYPE

(January 1984 dollars in millions)

	Streams	Rivers	Lakes	Estuaries	Oceans	Totals
Alaska	$ 0	$ 0	$ 0	$ 6	$ 0	$ 6
California	0	0	0	396	118	514
Colorado	11	4	0	0	0	15
Connecticut	0	31	0	410	0	441
Delaware	0	0	0	182	0	182
Dist. of Columbia	0	0	0	31	0	31
Florida	0	0	3	0	0	3
Georgia	127	39	0	3	0	169
Idaho	0	8	0	0	0	8
Illinois	885	1,637	0	0	0	2,522
Indiana	171	984	60	0	0	1,215
Iowa	19	147	0	0	0	166
Kansas	0	252	0	0	0	252
Kentucky	0	201	0	0	0	201
Maine	2	132	0	251	2	387
Maryland	3	14	0	8	0	25
Massachusetts	119	439	0	895	0	1,453
Michigan	44	680	6		0 0	0 730
Minnesota	0	514	0	0	0	514
Missouri	5	1,020	0	0	0	1,025
Montana	0	1	0	0	0	1
Nebraska	0	16	0	0	0	16
New Hampshire	5	205	0	14	0	224
New Jersey	23	143	0	1,010	0	1,176
New York	118	1,174	19	4,816	0	6,127
North Carolina	0	1	0	0	0	1
North Dakota	0	8	0	0	0	8
Ohio	122	1,056	61	0	0	1,239
Oregon	0	440	0	4	0	444
Pennsylvania	323	483	112	512	0	1,430
Rhode Island	0	0	0	316	0	316
South Dakota	0	24	0	0	0	24
Tennessee	0	610	0	0	0	610
Vermont	1	66	19	0	0	86
Virginia	4	31	0	135	0	170
Washington	0	287	1	370	0	658
West Virginia	55	560	0	0	0	615
Wisconsin	0	183	0	0	0	183
Puerto Rico	20	0	0	0	0	20
TOTAL	$2,057	$11,390	$281	$9,359	$120	$23,207

Appendix B

Cost Summaries from the 1982 Needs Survey

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CURRENT 1982 AND YEAR 2000 NEEDS REPORTED IN THE 1982 NEEDS SURVEY .. B-4

Table B-1 - Current 1982 Needs B-5

Table B-2 - Year 2000 Needs B-6

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Current 1982 and Future Year 2000 Needs Reported in the 1982 Needs Survey

Tables B-1 and B-2 summarize the results of the EPA's 1982 Needs Survey. Current 1982 needs are listed in Table B-1 and total year 2000 needs are listed in Table B-2. These were Tables 1 and 21, respectively, in Appendix C of the 1982 Needs Survey Report to Congress. All values are given in millions of 1982 dollars.

These tables are provided as a convenience to those who wish to compare the 1982 and the 1984 Survey results. These tables are comparable to Tables A-1 and A-9 of the 1984 Report. Please note that Tables B-1 and B-2 are given in millions of 1982 dollars. To convert from 1982 to 1984 dollars, a factor of 1.0923 can be used for Categories I and II, and a factor of 1.1246 can be used for Categories IIIA, IIIB, IVA, IVB, and V.

TABLE B-1

CURRENT 1982 NEEDS REPORTED IN THE 1982 NEEDS SURVEY

(January 1982 dollars in millions)

	Total Needs	Category of Need						
		I	II	IIIA	IIIB	IVA	IVB	V
Alabama	$ 801	$ 258	$ 80	$ 88	$ 5	$ 296	$ 74	$ 0
Alaska	250	101	0	2	1	84	44	18
Arizona	278	115	1	1	1	133	27	0
Arkansas	289	122	21	19	2	93	32	0
California	3,204	986	50	62	156	1,098	286	566
Colorado	194	118	4	5	1	19	4	42
Connecticut	1,933	323	44	24	17	551	199	775
Delaware	372	20	5	1	2	32	20	292
Dist. of Columbia	83	0	9	6	0	0	0	68
Florida	2,279	809	142	77	0	871	371	9
Georgia	1,269	262	129	93	15	231	124	415
Hawaii	334	77	0	0	17	191	49	0
Idaho	323	87	5	7	2	78	28	116
Illinois	3,532	322	508	178	55	181	192	2,396
Indiana	3,705	221	110	48	3	248	108	2,967
Iowa	1,154	396	77	86	1	110	57	427
Kansas	856	156	1	49	22	97	138	393
Kentucky	2,499	295	84	104	5	399	161	1,451
Louisiana	792	205	7	77	16	334	153	0
Maine	1,321	165	2	18	6	197	103	830
Maryland	831	107	227	14	131	226	51	75
Massachusetts	4,747	1,234	103	21	18	807	574	1,990
Michigan	4,522	984	223	73	99	506	480	2,157
Minnesota	1,105	353	75	28	17	129	182	321
Mississippi	508	230	45	55	1	115	62	0
Missouri	2,317	644	2	38	49	210	327	1,047
Montana	235	27	1	1	1	35	6	164
Nebraska	232	130	0	1	1	20	7	73
Nevada	109	38	24	3	4	33	7	0
New Hampshire	1,160	225	5	10	5	264	207	444
New Jersey	5,426	1,847	279	227	2	441	615	2,015
New Mexico	122	73	1	0	1	38	9	0
New York	16,128	3,290	179	186	3,760	2,327	766	5,620
North Carolina	1,070	300	127	84	1	404	151	3
North Dakota	34	13	0	1	1	3	3	13
Ohio	6,326	694	463	135	21	669	465	3,879
Oklahoma	276	105	6	14	10	85	56	0
Oregon	1,275	95	21	71	18	314	82	674
Pennsylvania	5,354	904	184	16	1	1,315	288	2,646
Rhode Island	628	174	12	3	30	154	77	178
South Carolina	673	130	30	76	0	267	170	0
South Dakota	130	65	9	3	1	3	5	44
Tennessee	1,454	301	128	154	4	399	121	347
Texas	2,053	833	99	182	30	419	469	21
Utah	212	94	38	11	0	48	18	3
Vermont	475	84	20	8	3	69	30	261
Virginia	1,468	484	64	18	2	391	230	279
Washington	2,767	466	17	116	63	529	284	1,292
West Virginia	2,437	358	20	4	3	700	184	1,168
Wisconsin	1,843	518	86	32	80	211	546	370
Wyoming	69	40	3	1	0	3	3	19
American Samoa	37	14	0	0	0	7	16	0
Guam	19	8	0	1	1	7	2	0
Mariana Islands	39	10	1	0	0	15	13	0
Puerto Rico	956	174	3	19	12	330	246	172
Trust Territories	77	41	1	0	0	24	11	0
Virgin Islands	27	11	0	1	0	12	3	0
TOTAL	$92,609	$20,136	$3,775	$2,553	$4,697	$16,772	$ 8,936	$35,740

TABLE B-2

YEAR 2000 NEEDS REPORTED IN THE 1982 NEEDS SURVEY

(January 1982 dollars in millions)

	Total Needs	Category of Need						
		I	II	IIIA	IIIB	IVA	IVB	V
Alabama	$1,176	$ 361	$ 107	$ 88	$ 5	$ 355	$ 260	$ 0
Alaska	415	180	0	2	1	99	115	18
Arizona	624	280	4	1	1	188	150	0
Arkansas	557	270	36	19	2	126	104	0
California	5,596	2,435	144	62	156	1,487	746	566
Colorado	551	312	15	6	1	29	146	42
Connecticut	2,180	364	60	24	17	686	254	775
Delaware	436	42	21	1	2	41	37	292
Dist. of Columbia	83	0	9	6	0	0	0	68
Florida	4,590	1,681	270	77	0	1,219	1,334	9
Georgia	1,954	535	196	94	15	325	374	415
Hawaii	590	182	0	0	17	284	107	0
Idaho	468	162	10	7	2	108	63	116
Illinois	4,469	598	966	178	55	210	366	2,096
Indiana	3,951	314	150	48	3	294	175	2,967
Iowa	1,444	491	94	86	1	123	222	427
Kansas	1,158	254	1	51	22	128	309	393
Kentucky	3,072	397	113	104	5	478	524	1,451
Louisiana	1,409	538	20	77	16	391	367	0
Maine	1,416	198	3	18	6	227	134	830
Maryland	1,228	195	264	14	131	266	283	75
Massachusetts	5,155	1,376	123	21	18	886	741	1,990
Michigan	5,236	1,322	303	73	99	590	692	2,157
Minnesota	1,481	578	126	28	17	158	253	321
Mississippi	804	358	68	55	1	135	187	0
Missouri	3,081	1,082	4	38	49	252	609	1,047
Montana	286	44	3	1	1	36	37	164
Nebraska	367	197	0	1	1	29	66	73
Nevada	220	101	37	3	4	46	29	0
New Hampshire	1,411	318	7	10	5	312	315	444
New Jersey	6,216	2,188	354	227	2	578	852	2,015
New Mexico	252	149	2	0	1	47	53	0
New York	17,294	3,763	244	186	3,760	2,670	1,051	5,620
North Carolina	1,779	448	165	87	1	510	565	3
North Dakota	60	31	0	1	1	3	11	13
Ohio	7,313	1,046	642	136	21	807	782	3,879
Oklahoma	516	240	17	14	10	117	118	0
Oregon	1,560	189	39	71	18	363	206	674
Pennsylvania	6,391	1,320	306	16	1	1,611	491	2,646
Rhode Island	674	194	13	3	30	167	89	178
South Carolina	1,027	198	41	76	0	358	354	0
South Dakota	204	106	17	3	1	3	30	44
Tennessee	2,148	444	179	154	4	500	520	347
Texas	3,993	1,752	165	182	30	588	1,255	21
Utah	565	346	75	11	0	68	62	3
Vermont	500	96	24	8	3	77	31	261
Virginia	1,908	658	103	18	2	502	346	279
Washington	3,781	876	24	116	63	686	724	1,292
West Virginia	2,617	432	25	4	3	747	238	1,168
Wisconsin	2,432	896	144	32	81	288	621	370
Wyoming	145	92	7	1	0	3	23	19
American Samoa	56	23	0	0	0	7	26	0
Guam	39	23	0	1	1	7	7	0
Mariana Islands	63	16	1	0	0	22	24	0
Puerto Rico	1,286	370	5	19	12	391	317	172
Trust Territories	107	60	1	0	0	25	21	0
Virgin Islands	43	15	0	1	0	14	13	0
TOTAL	$118,377	$31,136	$5,747	$2,560	$4,698	$20,667	$17,829	$35,740

Appendix C

Technical Information Summaries

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Introduction

This appendix contains summaries of the technical information collected during the 1984 Needs Survey. These summaries give details on the number of wastewater facilities, the population served by these facilities, and the levels of treatment they are designed to achieve. The tables include information on the current 1984 status of wastewater treatment plants and collection systems, as well as the projected status when all identified year 2000 needs are met.

Two terms are referred to when discussing the operational status of wastewater facilities. They are as follows:

- In Operation in 1984: Treatment facilities that are operational in 1984. New facilities under construction in 1984 and treatment facilities planned to be constructed by the year 2000 are not included.
- In Operation When All Identified Year 2000 Needs are Met: Treatment facilities projected to be operational when all identified year 2000 needs are met. This includes facilities presently on-line that will remain operational through the year 2000, new facilities under construction in 1984, and new facilities planned to be built by the year 2000. Facilities that are presently on-line but are to be taken out of service by the year 2000 are excluded.

Number of Operational Treatment Plants and Collection Systems in 1984 and When All Identified Year 2000 Needs are Met

Tables C-1 and C-2 summarize the number of facilities in operation in 1984 and the number projected to be in operation when all identified year 2000 needs are met. These summaries give the number of treatment facilities and collection systems in each State and U.S. Territory.

TABLE C-1

NUMBER OF OPERATIONAL TREATMENT PLANTS AND COLLECTION SYSTEMS IN 1984

	Treatment Plants	Collection Systems
Alabama	231	271
Alaska	44	51
Arizona	118	134
Arkansas	290	313
California	583	763
Colorado	283	333
Connecticut	102	137
Delaware	21	35
Dist. of Columbia	1	1
Florida	263	330
Georgia	381	485
Hawaii	29	34
Idaho	149	164
Illinois	720	959
Indiana	357	397
Iowa	685	713
Kansas	566	576
Kentucky	225	271
Louisiana	312	335
Maine	98	159
Maryland	145	195
Massachusetts	112	202
Michigan	372	604
Minnesota	510	632
Mississippi	307	332
Missouri	538	583
Montana	160	164
Nebraska	452	516
Nevada	52	54
New Hampshire	72	95
New Jersey	224	498
New Mexico	102	112
New York	467	848
North Carolina	496	574
North Dakota	283	285
Ohio	689	855
Oklahoma	497	511
Oregon	206	242
Pennsylvania	664	1,245
Rhode Island	20	31
South Carolina	226	286
South Dakota	268	271
Tennessee	234	258
Texas	1,268	1,518
Utah	95	152
Vermont	90	99
Virginia	238	318
Washington	244	306
West Virginia	157	218
Wisconsin	570	707
Wyoming	108	115
American Samoa	2	2
Guam	7	7
Mariana Islands	2	2
Puerto Rico	33	33
Trust Territories	6	6
Virgin Islands	4	4
TOTAL	15,378	19,341

TABLE C-2

NUMBER OF OPERATIONAL TREATMENT PLANTS AND COLLECTION SYSTEMS WHEN ALL IDENTIFIED YEAR 2000 NEEDS ARE MET

	Treatment Plants	Collection Systems
Alabama	336	416
Alaska	57	60
Arizona	175	197
Arkansas	482	534
California	902	1,157
Colorado	294	353
Connecticut	107	168
Delaware	22	42
Dist. of Columbia	1	1
Florida	336	493
Georgia	432	597
Hawaii	43	54
Idaho	198	222
Illinois	849	1,146
Indiana	501	582
Iowa	802	844
Kansas	581	606
Kentucky	388	459
Louisiana	447	518
Maine	207	244
Maryland	250	345
Massachusetts	150	267
Michigan	477	805
Minnesota	575	720
Mississippi	480	574
Missouri	638	736
Montana	181	186
Nebraska	465	530
Nevada	73	80
New Hampshire	141	179
New Jersey	146	545
New Mexico	142	155
New York	877	1,494
North Carolina	634	809
North Dakota	299	303
Ohio	775	1,091
Oklahoma	587	618
Oregon	226	277
Pennsylvania	1,169	1,994
Rhode Island	25	39
South Carolina	294	413
South Dakota	284	286
Tennessee	299	373
Texas	2,094	2,409
Utah	183	261
Vermont	99	113
Virginia	310	484
Washington	335	439
West Virginia	502	615
Wisconsin	620	822
Wyoming	113	128
American Samoa	2	2
Guam	6	6
Mariana Islands	3	3
Puerto Rico	32	34
Trust Territories	21	21
Virgin Islands	4	4
TOTAL	20,671	26,853

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Number of Treatment Plants by Flow Range

Table C-3 is a summary by flow range of all treatment plants in operation in 1984, as well as those projected to be in operation when all identified year 2000 needs are met.

This table gives four flow ranges in millions of gallons per day (mgd) for 1984 and 2000, the number of plants in each range, and the cumulative total of their design flow capacities. These data are for all types of treatment plants, regardless of their level of treatment. Other tables in this appendix provide summaries by level of treatment for both existing and projected plants.

TABLE C-3

NUMBER OF TREATMENT PLANTS BY FLOW RANGE

Treatment Plants in Operation in 1984

Flow Ranges (mgd)	Number of Plants	Flow Capacity (mgd)
0.01 to 0.10	5,032	251
0.11 to 1.00	6,962	2,649
1.01 to 10.00	2,833	9,250
10.01 and up	551	23,775
TOTAL	15,378	35,925

Treatment Plants Projected to be in Operation When All Identified Year 2000 Needs are Met

Flow Ranges (mgd)	Number of Plants	Flow Capacity (mgd)
0.01 to 0.10	8,416	401
0.11 to 1.00	8,313	2,998
1.01 to 10.00	3,255	10,596
10.01 and up	687	29,228
TOTAL	20,671	43,223

Treatment Plant Information by Level of Treatment

Table C-4 summarizes the degree of treatment received by all wastewater collected in the United States in 1984 and the degree of treatment projected to be received when all identified year 2000 needs are met. This summary provides details on the number of plants and their associated flow by level of treatment. Explanations of the category terms are as follows:

- Average Daily Flow: Compiled from actual average daily flow data for a treatment plant during the most recent 12-month period for which information was available. This value is applicable only for treatment plants in operation in 1984.
- Design Capacity: The average daily flow that a treatment plant is designed to accommodate.

All flows values are given in millions of gallons per day (mgd).

Definitions of the levels of treatment (no discharge, primary, secondary, etc.) are given in subsequent tables that summarize each individual level of treatment.

TABLE C-4

TREATMENT PLANT INFORMATION
BY LEVEL OF TREATMENT

Treatment Plants in Operation in 1984

Level of Treatment	Number of Facilities	Design Capacity (mgd)	Average Daily Flow in 1984 (mgd)
Raw Discharge	202	NA	NA
Less Than Secondary	2,617	6,510	5,335
Secondary	8,070	14,603	11,047
Greater Than Secondary	2,965	13,874	10,113
No Discharge	1,726	938	600
TOTAL	15,580	35,925	27,095

Treatment Plants Projected to be in Operation When All Identified Year 2000 Needs are Met

Level of Treatment	Number of Facilities	Design Capacity (mgd)
Raw Discharge	0	NA
Less Than Secondary	14	1,464
Secondary	11,510	17,682
Greater Than Secondary	6,378	22,217
No Discharge	2,769	1,860
TOTAL	20,671	43,223

Treatment Plant Operational Data: In 1984 and When All Identified Year 2000 Needs are Met

Table C-5 summarizes information pertaining to pollutant loadings, removal efficiencies, and discharge rates for all treatment plants in operation in 1984, as well as for when all identified year 2000 needs are met. This table gives an estimate of the overall average daily pollutant loads received by all treatment plants, and an estimate of the quantities of pollutant in the effluent of facilities discharging to rivers and streams. Also summarized is the number of people now served and projected to be served in the future.

This summary represents the national average of operational data for all treatment plants without regard to the level of treatment provided. National summaries for the performance of plants by specific levels of treatment are provided in subsequent tables.

All flows values are given in millions of gallons per day (mgd), and all pollutant removal values are given in tons per day (tpd).

TABLE C-5

TREATMENT PLANT OPERATIONAL DATA: IN 1984 AND WHEN ALL IDENTIFIED YEAR 2000 NEEDS ARE MET

	1984	When All Identified Year 2000 Needs Are Met
Number of Treatment Plants	**15,378**	**20,671**
Number of People Served	**169,370,000**	**246,451,000**
Percent of the Nation	**74%**	**93%**
Removal Efficiencies		
Flow	**27,095 mgd**	**43,223 mgd**
Influent BOD_5	**23,339 tpd**	**40,696 tpd**
Effluent BOD_5	**3,773 tpd**	**4,190 tpd**
Percent Removal	**84%**	**90%**
Influent Solids	**26,393 tpd**	**42,977 tpd**
Effluent Solids	**3,705 tpd**	**4,628 tpd**
Percent Removal	**86%**	**89%**

Number of Treatment Plants Not Meeting Secondary Requirements

Table C-6 summarizes information for wastewater treatment plants that are not meeting the secondary requirements defined in the Clean Water Act. These plants are designed to achieve less than secondary treatment.

Treatment plants included in this summary provide either no treatment (raw discharge), primary treatment, or advanced primary treatment. Primary and advanced primary treatment generally include unit processes such as communition, screening, grit removal, and primary sedimentation units. Advanced primary treatment facilities may provide some biological treatment, but are unable to treat wastewater to the degree necessary to comply with EPA's definition of secondary treatment. Both primary and advanced primary plants are included under the "less than secondary" portion of the table.

Some facilities collect wastewater and discharge it to the environment as raw waste. The wastewater is not subjected to any treatment beyond what is considered preliminary treatment. Preliminary treatment would include communition, screening, grit removal, etc., but not primary sedimentation. In 1984, there were 202 communities discharging raw waste. When the identified year 2000 needs are met, these communities will have built treatment facilities or interceptors to neighboring facilities to eliminate the raw discharge.

The removal efficiencies, including existing and projected year 2000 conditions, are calculated from the average daily flow, average daily influent concentrations, and average daily effluent concentrations. The current averages are based on the actual performance of each individual treatment plant for the most recent 12-month period for which information could be obtained. The main sources of information for current flow and concentration values were the self-monitoring reports submitted by every facility with an NPDES permit. The future projected averages are based on the conditions that would result when each individual treatment plant is upgraded to meet NPDES-mandated levels of treatment. We assume these plants will meet their NPDES permit requirements when all identified year 2000 needs are met.

All flow values are given in millions of gallons per day (mgd), and all pollutant removal values are given in tons per day (tpd).

TABLE C-6

NUMBER OF TREATMENT PLANTS NOT MEETING SECONDARY REQUIREMENTS

Raw Discharge	1984	When All Identified Year 2000 Needs Are Met
Number of Communities	202	0
Number of People Served	1,273,000	0
Percent of the Nation	0.6%	0%

Removal Efficiencies

Not applicable. There is no treatment, therefore, no removal efficiency can be calculated.

Less Than Secondary Treatment	1984	When All Identified Year 2000 Needs Are Met
Number of Treatment Plants	2,617	14*
Number of People Served	33,675,000	12,052,000
Percent of the Nation	15%	5%
Removal Efficiencies		
Flow	5,335 mgd	1,464 mgd
Influent BOD_5	4,917 tpd	2,063 tpd
Effluent BOD_5	2,030 tpd	658 tpd
Percent Removal	59%	68%
Influent Solids	5,431 tpd	2,258 tpd
Effluent Solids	1,602 tpd	621 tpd
Percent Removal	71%	73%

* These treatment plants have applied for a waiver from the secondary treatment requirements in accordance with section 301(h) of the Clean Water Act. All have received at least tentative approval.

Number of Treatment Plants Meeting or Exceeding Secondary Requirements

Table C-7 summarizes the information for wastewater treatment plants that are designed to meet or exceed the secondary treatment requirements of the Clean Water Act. Secondary treatment plants generally include some type of preliminary treatment process followed by a biological process (trickling filter, activated sludge, rotating biological contactor, etc.) with no additional treatment processes, except disinfection.

Advanced treatment plants include both advanced secondary and tertiary treatment. The treatment levels attained by advanced secondary plants or tertiary plants are defined in terms of the effluent BOD_5 concentration or the removal of phosphorus (PO_4), ammonia (NH_3), or nitrogen (N).

A plant is considered to be advanced secondary in design if it is capable of consistently producing an effluent with a BOD_5 concentration in the range of 24 mg/l to 10 mg/l, or it has specific processes that remove phosphorus or ammonia in excess of the amounts normally removed by secondary treatment.

A plant is considered to be tertiary in design if it is capable of consistently producing an effluent with a BOD_5 concentration less than 10 mg/l, or it has specific processes that can remove more than 50 percent of the total nitrogen present in the plant influent.

The removal efficiencies of BOD_5 and suspended solids were derived from the average daily flow, and the average daily influent and effluent pollutant concentrations. The current averages are based on the actual performance of individual treatment plants during the most recent 12-month period for which information could be obtained. The main source of information for current conditions was the self-monitoring reports submitted by every plant with an NPDES permit. The future projections for meeting year 2000 needs are based on the conditions that would exist after a plant is in compliance with its NPDES permit requirements.

All flow values are given in millions of gallons per day (mgd), and all pollutant removal values are given in tons per day (tpd).

TABLE C-7

NUMBER OF TREATMENT PLANTS MEETING OR EXCEEDING SECONDARY REQUIREMENTS

Secondary Treatment	1984	When All Identified Year 2000 Needs Are Met
Number of Treatment Plants	8,070	11,510
Number of People Served	70,656,000	101,513,000
Percent of the Nation	31%	38%
Removal Efficiencies		
Flow	11,047 mgd	17,682 mgd
Influent BOD_5	9,448 tpd	17,053 tpd
Effluent BOD_5	1,135 tpd	2,110 tpd
Percent Removal	88%	88%
Influent Solids	10,012 tpd	17,337 tpd
Effluent Solids	1,390 tpd	2,253 tpd
Percent Removal	86%	87%

Better Than Secondary Treatment	1984	When All Identified Year 2000 Needs Are Met
Number of Treatment Plants	2,965	6,378
Number of People Served	59,525,000	117,910,000
Percent of the Nation	26%	44%
Removal Efficiencies		
Flow	10,113 mgd	22,217 mgd
Influent BOD_5	8,371 tpd	19,787 tpd
Effluent BOD_5	608 tpd	1,422 tpd
Percent Removal	93%	93%
Influent Solids	10,396 tpd	21,624 tpd
Effluent Solids	713 tpd	1,754 tpd
Percent Removal	93%	92%

Number of Nondischarging Treatment Plants

Table C-8 summarizes information for wastewater treatment plants that are designed to be nondischarging; i.e., treated wastewater is not discharged to any stream or river. The majority of the nondischarging plants are lagoon systems designed to dispose of the total flow they receive by means of evaporation or percolation to groundwater. Also included are plants that dispose of their effluent by recycling, reuse, spray irrigation or other land disposal, or groundwater recharge.

All flow values are given in millions of gallons per day (mgd), and all pollutant removal values are given in tons per day (tpd).

TABLE C-8

NUMBER OF NONDISCHARGING TREATMENT PLANTS

Nondischarging Treatment Plants	1984	When All Identified Year 2000 Needs Are Met
Number of Treatment Plants	1,726	2,769
Number of People Served	5,514,000	14,976,000
Percent of the Nation	2%	6%
Removal Efficiencies		
Flow	600 mgd	1,860 mgd
Influent BOD_5	603 tpd	1,793 tpd
Effluent BOD_5	0 tpd	0 tpd
Percent Removal	100%	100%
Influent Solid	554 tpd	1,758 tpd
Effluent Solid	0 tpd	0 tpd
Percent Removal	100%	100%

Projected Changes for Treatment Plants

Table C-9 summarizes the dollar needs identified for changes to treatment plants that were operational in 1984, plus the dollar needs for new plants projected to be built when all identified year 2000 needs are met.

The table is divided into two sections. The first section details the planned changes and related costs for all treatment plants operational in 1984. The second section summarizes the number and identified costs for new plants projected to be built when all identified year 2000 needs are met.

TABLE C-9

PROJECTED CHANGES FOR TREATMENT PLANTS

Changes for Treatment Plants Operational in 1984

Type of Change	Number of Plants	Identified Needs (millions)
Enlargement	1,824	$ 6,156
Upgrade	1,692	4,703
Enlarge and Upgrade	1,927	10,498
Replace	1,203	1,810
Abandon	1,171	17
Other	713	3,958
No Change	6,848	0
TOTAL	15,378	$27,142

New Treatment Plants Projected to be Built When All Identified Year 2000 Needs are Met

Level of Treatment	Number of Plants	Identified Needs (millions)
Secondary	3,706	$3,478
Greater Than Secondary	1,762	2,796
No Discharge	835	1,066
TOTAL	6,303	$7,340

Summary of Treatment Plant Unit Processes

Table C-10 summarizes the inventory of unit processes compiled during the 1984 Survey. Two categories of information were developed for each unit process: "Now in Use" and "To be Built." In each category, the total number of processes is listed with an associated total flow. For the "Now In Use" category, total flow was compiled from the present design flow of the facilities. For the "To be Built" category, total flow was compiled from the projected design flow of the plants. All flow values are given in millions of gallons per day (mgd). A flow value given as 0+ indicates that the flow is greater than 0 but less than 1 mgd.

As defined here, a unit process includes the complete process. For example, activated sludge includes the aeration basin, associated blowers and other integral mechanical equipment, and the secondary clarifier. These items are not listed separately.

Multiple or parallel processes are counted only once for any plant. For example, if a plant has four aerobic digesters, the number of aerobic digesters counted in this summary is one, not four. Therefore, the "Number" column denotes the number of plants using that process.

TABLE C-10

SUMMARY OF TREATMENT PLANT UNIT PROCESSES

Process	Now In Use		To be Built	
	Number	Flow (mgd)	Number	Flow (mgd)
Primary Treatment				
Influent Pumping	6,998	26,529	3,208	259
Bar Screen	9,204	31,290	5,378	279
Grit Removal	4,638	26,167	1,508	986
Comminution	4,333	12,090	1,282	214
Scum Removal	395	6,750	42	319
Flow Equalization	585	2,973	403	2,209
Preaeration	433	6,629	51	181
Primary Sedimentation	5,069	28,409	1,382	903
Imhoff Tank	431	117	6	0+
Biological Treatment				
Stabilization Ponds	5,298	3,138	2,783	118
Aerated Lagoons	1,368	1,516	1,494	148
Containment Ponds	834	252	433	30
Aquaculture	2	2	3	2
Trickling Filters	2,463	6,345	107	408
Activated Bio-Filter	8	21	5	8
RBC's	347	940	276	433
Activated Sludge	5,690	27,302	2,585	2,713
Oxidation Ditch	741	500	474	131
Biological Removal-				
Nitrification	860	6,303	1,533	2,553
Denitrification	40	226	42	373
Phosphorus Removal	18	222	9	55
Land Treatment				
Overland Flow Systems	12	6	21	6
Rapid Infiltration	60	72	19	12
Slow Rate	854	1,167	488	243
Physical/Chemical Treatment				
Microstrainers	135	1,041	48	97
Filters	1,831	5,785	2,759	2,864
Activated Carbon	36	458	12	242
Lime Treatment	130	888	80	263
Recalcination	24	437	6	23
Recarbonation	52	272	27	158
Neutralization	23	124	9	13

TABLE C-10 (Cont'd)

SUMMARY OF TREATMENT PLANT UNIT PROCESSES

Process	Now In Use		To be Built	
	Number	Flow (mgd)	Number	Flow (mgd)
Alum Addition	594	3,459	442	907
Ferric-Chloride	269	3,192	69	146
Polymer Addition	80	2,023	75	192
Ion Exchange	3	2	4	4
Breakpoint Chlorination	17	274	18	351
Ammonia Stripping	7	89	4	12
Dechlorination	237	1,066	156	472
Post-Aeration	979	3,832	793	813
Outfall Pumping	246	3,550	245	396
Outfall Diffuser	87	1,392	36	938
Disinfection				
Chlorination	8,564	25,797	6,040	2,164
Ozonation	33	462	14	51
Ultraviolet	25	67	13	1
Noncentralized Treatment				
Septic Tank	188	9	140	1
Standard Leach Field	6	0+	15	0+
Mound System	3	0+	19	0+
Evapotranspiration Bed	1	0+	2	0+
Aerobic Unit	0	0	0	0
Sand Filter	5	0+	28	0+
Multiple Leach Fields	7	0+	29	0+
Septic Tank Effluent Pumping	6	0+	15	0+
Sewers-				
Small Diameter	9	0+	36	0+
Pressure	5	0+	10	0+
Vacuum	0	0+	6	0+
Sludge Treatment				
Digestion-				
Aerobic	3,547	5,500	1,678	682
Anaerobic	3,873	22,087	890	766
Composting	47	1,362	34	394
Heat Treatment	149	3,035	17	536
Chlorine Oxidation	37	403	6	10
Lime Stabilization	80	936	28	157
Wet Air Oxidation	51	788	1	0+

TABLE C-10 (Cont'd)

SUMMARY OF TREATMENT PLANT UNIT PROCESSES

Process	Now In Use		To be Built	
	Number	Flow (mgd)	Number	Flow (mgd)
Air Drying	6,473	11,634	2,372	1,610
Sludge Lagoons	612	3,252	108	330
Dewatering	1,658	19,951	499	4,246
Gravity Thickening	892	11,609	260	894
Elutriation	2	1	2	0+
Air Flotation Thickening	269	4,555	92	1,298
Chemical Addition	85	916	78	406
Incineration	318	7,635	46	2,174
Pyrolysis	3	49	4	19
Digestor Gas Utilization	209	3,760	35	798
Heat Recovery	2	3	0	0
Sludge Disposal				
Landfill/Trenching	7,157	23,886	2,577	1,124
Land Spreading	2,600	8,559	542	548
Ocean Disposal	40	2,686	5	73
Sludge Distribution	8	42	8	48
Facility Control				
Administration Building	8,588	29,416	4,996	416
Automated Controls	131	3,459	20	126
Semi-Automated	10,535	30,175	3,985	508
Manually Controlled	4,573	3,887	2,516	378
Facility Construction				
Package	1,556	756	968	18
Semi-Package	6,460	11,613	2,371	364
Custom Built	11,901	35,293	4,624	255

Summary of Additions to Collection Systems

Table C-11 summarizes the population receiving collection in 1984 and the population that will be receiving collection when all identified year 2000 needs are met. Also summarized are the total length of new sewer pipes projected to be built, and the number of new pumping stations. The total length of new sewers is divided into size ranges. For new pumping stations, a "pumping capacity" is given, which represents the cumulative average daily pumping capacity of these stations.

TABLE C-11

SUMMARY OF ADDITIONS TO COLLECTION SYSTEMS

	1984	When All Identified Year 2000 Needs Are Met
Population Receiving Collection	170,643,000	246,451,000
Percent of the Nation	75%	93%

Required Additions

Sewer Pipes

Diameter (inches)	Length (miles)	Cost (millions)
0-18	87,080	$31,160
19-27	3,941	2,719
28-48	3,418	3,827
49-78	961	1,945
79+	134	1,327
TOTAL	95,534	$40,978

Pumping Stations

Number of Stations	Pumping Capacity (mgd)	Cost (millions)
17,325	10,500	$2,455

Summary of Collection System Improvements

Table C-12 summarizes the information available on collection systems that require improvements. Two general types of improvements are summarized: correction of excessive infiltration/inflow (I/I), and correction of structural deficiencies by major rehabilitation. All collection systems referred to in this table were operational in 1984.

TABLE C-12

SUMMARY OF COLLECTION SYSTEM IMPROVEMENTS

Information on Collection Systems with Excessive Infiltration/Inflow (I/I)

Recommended corrections for systems with excessive infiltration/inflow (I/I)

	Number of Systems	Dollars (millions)
Seal sewer lines	1,430	$1,141
Replace or reline sewer sections	1,015	1,399
Change or create flow routing system	8	3
Provide flow equalization	23	23
Not known	240	148
Other	84	107
Total	2,800	$2,821

Estimated excessive I/I flow 2,062 mgd

Information on Collection Systems Requiring Major Rehabilitation

	Number of Systems	Dollars (millions)
Collection systems requiring major rehabilitation	451	$3,172

Existing Combined Sewer Systems

Table C-13 presents a summary of selected data reported for all combined sewer systems. For systems with no planning for control or correction of combined sewer overflows, this information represents most of the key data used to estimate the Category V need.

Listed in the table are the total number of combined systems, the area served by the combined system, and population served by the State. The number of sewer systems in each State corresponds to the number of authorities/facilities identified as having a combined-type collection or treatment system. A system usually includes a number of combined sewer overflow points from which combined wastewater/stormwater is discharged directly into the receiving water. The combined sewer area is the area, in acres, drained directly by the combined sewer system. The population served is the total number of people resident to the area drained directly by the combined sewer system. States without combined sewers are not shown.

TABLE C-13

EXISTING COMBINED SEWER SYSTEMS

	Number of Systems	Combined Sewer Area (acres)	CSO Population Served
Alaska	2	320	4,860
California	4	255,920	852,120
Colorado	4	17,650	152,340
Connecticut	16	17,700	384,870
Delaware	5	8,450	90,070
Dist. of Columbia	1	14,710	489,090
Florida	1	630	4,370
Georgia	8	26,760	330,240
Idaho	13	9,310	46,010
Illinois	107	384,510	5,716,270
Indiana	129	331,820	2,536,000
Iowa	20	23,220	343,560
Kansas	3	28,500	464,000
Kentucky	17	50,230	768,560
Maine	58	124,490	379,660
Maryland	10	5,870	53,890
Massachusetts	35	69,420	1,886,160
Michigan	91	243,790	2,382,510
Minnesota	19	28,360	530,650
Missouri	14	88,610	871,500
Montana	13	6,730	100,880
Nebraska	3	16,910	199,410
New Hampshire	22	14,120	227,860
New Jersey	31	119,320	2,008,720
New York	85	445,390	12,233,340
North Carolina	1	10,570	38,350
North Dakota	8	2,370	40,170
Ohio	116	318,660	2,701,000
Oregon	15	38,690	334,430
Pennsylvania	125	226,630	4,154,190
Rhode Island	3	9,540	220,550
South Dakota	13	6,120	93,990
Tennessee	5	20,290	150,500
Texas	1	4,670	35,000
Vermont	33	16,830	128,310
Virginia	11	25,320	536,900
Washington	41	72,290	510,440
West Virginia	47	62,070	476,530
Wisconsin	11	28,690	623,230
Puerto Rico	1	1,070	600,000
TOTAL	1,142	3,176,550	43,700,530

Needs and Grants Data by Subbasin

Table C-14 lists 1984 Needs Survey data and Federal wastewater treatment grant awards by subbasin and hydrologic region. Much of the water quality analysis in the 1984 Needs Survey was performed on a subbasin basis and then aggregated into hydrologic regions for reporting purposes. Only in this table are specific subbasin data presented. Included are the total 1984 current and year 2000 needs in millions of 1984 dollars, total grants obligated through 1984 in millions of unadjusted dollars, and the total population in thousands served by wastewater treatment facilities now and when total year 2000 needs are met.

For the Needs Survey, the continental United States was divided into 314 subbasins. A subbasin is defined in the Glossary, and Figure 1 in the 1984 Needs Survey Report depicts the hydrologic regions by name. This table presents each subbasin within a hydrologic region by number and by name. The subbasin name represents a major water body or other dominant feature.

Only the 18 hydrologic regions covering the continental United States were divided into subbasins; these were subdivided into river, stream, lake shore, and coastline segments, and subsequently used in the water quality simulation work. However, other aspects of the water quality analysis addressed all 21 hydrologic regions; therefore, all are included in this table. The California Hydrologic Region (number 18) departs slightly from the State boundary in places. For some of the 18 hydrologic regions, an "Other" category has been included in the list of subbasins to represent the few facilities not linked to an individual segment or subbasin.

TABLE C-14

NEEDS AND GRANTS DATA BY SUBBASIN

(Dollars in millions, population in thousands)

USGS Hydro Region/ Subbasin	1984 Current Needs ($1984)	2000 Total Needs ($1984)	Total Grants Obligated Through 1984 ($Nominal)	1984 Population Served	Year 2000 Needs Met Population Served
01 New England					
001 Housatonic River	1,197	1,375	494	1,862	2,345
002 Upper Connecticut River	144	167	86	110	163
003 Lower Connecticut River	518	635	344	1,257	1,700
004 Rhode Island	3,244	3,628	1,012	3,788	4,941
005 Merrimack River	780	982	491	740	1,253
006 Soco River	401	493	227	335	593
007 Kennebec River	78	88	66	93	149
008 Penobscot River	133	150	56	111	199
009 Aroostook River	31	37	26	41	62
010 Barton River	0	0	14	7	12
Region Total	6,526	7,555	2,816	8,344	11,417
02 Mid-Atlantic					
011 Peconic River	3,119	3,323	1,560	4,562	4,799
012 Lake Champlain	229	254	100	222	341
013 James River	430	532	323	1,405	2,148
014 Rappahannock River	207	258	106	417	659
015 Upper Potomac River	331	599	263	565	1,171
016 Lower Potomac River	1,313	1,620	1,229	4,518	5,882
017 Upper Susquehanna River	601	664	126	430	664
018 Middle Susquehanna River	453	547	105	781	1,173
019 Lower Susquehanna River	486	607	423	1,067	1,605
020 Chesapeake Bay	161	188	167	169	311
021 Upper Delaware River	687	837	366	1,142	1,545
022 Lower Delaware River	1,030	1,202	1,198	4,962	5,281
023 New Jersey Coast	3,629	3,874	1,786	5,318	5,950
024 Upper Hudson River	506	575	230	582	779
025 Lower Hudson River	1,753	1,925	236	3,273	3,020
Region Total	14,935	17,005	8,218	29,413	35,328
03 South Atlantic					
026 Pearl River	179	293	80	501	742
027 Pascagoula River	119	183	75	360	575
028 Tallapoosa River	43	71	32	110	199
029 Upper Coosa River	99	226	76	178	408
030 Lower Coosa River	139	182	19	179	317
031 Alabama River	124	194	49	366	595
032 Tombigee River	60	88	34	185	304
033 Black Warrior River	189	281	129	556	705
034 Mobile River	86	140	23	317	591
035 Conecuh River	158	296	84	341	630
036 Chockawhatchee River	57	115	32	135	225
037 Flat River	92	139	92	813	1,214
038 Chattahoochee River	310	552	171	931	1,681
039 Ochlokanee River	35	74	33	190	356
040 Suwanee River	68	101	40	267	383
041 South Florida River	1,920	3,447	1,072	4,227	9,083
042 St. Johns River	705	1,410	251	1,381	2,777
043 Satilla River	59	103	30	111	225
044 Ocmulgee River	144	274	146	641	1,211
045 Altamaha River	62	97	18	190	338
046 Ogeechee River	16	24	20	75	133
047 Upper Savannah River	66	120	56	117	228
048 Lower Savannah River	89	126	70	400	574

TABLE C-14 (cont'd)

NEEDS AND GRANTS DATA BY SUBBASIN

(Dollars in millions, population in thousands)

USGS Hydro Region/ Subbasin	1984 Current Needs ($1984)	2000 Total Needs ($1984)	Total Grants Obligated Through 1984 ($Nominal)	1984 Population Served	Year 2000 Need Met Population Served
049 Congaree River	334	815	134	871	1,720
050 Santee River	345	546	177	981	1,532
051 Upper Pee Dee River	213	374	164	382	813
052 Lower Pee Dee River	185	296	98	283	592
053 Cape Fear River	210	369	177	570	1,162
054 Neuse River	146	249	83	502	873
055 Tar River	75	124	60	159	231
056 Dan River	24	40	25	145	245
057 Roanoke River	45	48	38	208	293
058 Chowan River	47	61	30	81	134
Region Total	6,443	11,458	3,618	16,753	31,089
04 Great Lakes					
059 MN Lake Superior	4	5	86	126	131
060 WI Lake Superior	33	39	58	118	131
061 MI Lake Superior	75	94	49	110	154
062 Lower Michigan North	29	36	22	46	64
063 Menominee River	23	27	18	82	109
064 WI Lake Michigan	1,213	1,380	484	2,005	2,787
065 St. Joseph River	233	301	262	956	1,260
066 Grand River	289	335	586	1,191	1,719
067 Muskegon/Manistee River	128	152	69	233	338
068 Au Sable River	64	72	28	70	131
069 Saginaw Bay	173	231	373	949	1,303
070 Detroit River	1,466	1,851	746	3,848	4,136
071 Maunee River	375	543	424	1,347	1,851
072 Lake Erie	1,698	1,880	1,636	3,425	4,052
073 Genesee River	247	334	381	733	821
074 Finger Lakes	398	483	350	633	829
075 St. Lawrence River	81	87	45	131	159
Region Total	6,529	7,850	5,617	16,003	19,975
05 Ohio					
150 Monongahela River	482	548	190	703	1,128
151 Alleghany River	403	466	171	741	1,087
152 Ohio River	575	682	397	2,368	2,649
153 Muskingum River	453	555	184	682	1,016
154 Ohio River	200	226	59	241	432
155 New River	90	112	70	158	314
156 Kanawha River	398	452	182	296	650
157 Guyandotte River	190	226	12	26	160
158 Big Sandy River	251	298	36	37	205
159 Scioto River	319	379	202	1,169	1,333
160 Ohio River	112	137	87	280	395
161 Licking River	24	36	21	76	131
162 Great Miami River	264	407	231	1,018	1,406
163 Ohio River	220	359	212	1,273	1,619
164 Kentucky River	209	296	111	310	602
165 Green River	97	148	66	209	331
166 Ohio River	469	861	143	950	1,711
167 Upper Wabash River	71	91	104	341	496
168 White River	290	375	422	1,401	1,901
169 Lower Wabash River	142	174	128	696	932
170 Upper Cumberland River	132	155	20	82	180
171 Lower Cumberland River	213	343	179	583	1,145
178 Ohio River	57	81	7	109	142
Region Total	5,661	7,407	3,234	13,749	19,965

TABLE C-14 (cont'd)

NEEDS AND GRANTS DATA BY SUBBASIN

(Dollars in millions, population in thousands)

USGS Hydro Region/ Subbasin	1984 Current Needs ($1984)	2000 Total Needs ($1984)	Total Grants Obligated Through 1984 ($Nominal)	1984 Population Served	Year 2000 Needs Met Population Served
06 Tennessee					
172 French Broad River	308	533	88	389	883
173 Clinch River	92	111	10	38	121
174 Little Tennessee River	162	343	102	337	586
175 Upper Tennessee River	236	356	105	231	506
176 Middle Tennessee River	147	235	75	420	734
177 Lower Tennessee River	61	99	40	155	244
Region Total	1,006	1,677	420	1,570	3,074
07 Upper Mississippi					
082 Upper Minnesota River	30	35	51	120	145
083 Lower Minnesota River	78	130	59	453	654
084 Mississippi River	493	729	360	1,751	2,003
085 St. Croix River	35	54	15	86	139
086 Chippewa River	16	21	23	150	199
087 Mississippi River	51	75	92	387	561
088 Wisconsin River	87	114	22	262	387
089 Mississippi River WI	45	57	41	240	317
090 Rock River	122	211	192	1,021	1,463
091 Iowa River	181	267	104	594	714
092 Mississippi River	179	243	145	632	909
093 Upper Des Moines River	69	78	9	145	194
094 Lower Des Moines	278	313	92	425	594
095 Upper Illinois River	891	1,171	1,803	7,345	8,750
096 Lower Illinois River	246	312	110	992	1,315
097 Mississippi River IL	69	94	61	326	529
148 Kaskaskia River	44	64	33	236	313
149 MS River below St. Louis	1,103	1,261	305	1,868	2,293
Region Total	4,017	5,229	3,517	17,033	21,479
08 Lower Mississippi					
080 Calcasieu River	169	228	66	472	805
081 LA Gulf Coast	286	557	92	356	848
179 Mississippi River KY	322	455	95	918	1,405
180 St. Francis River	55	77	14	225	330
183 MS River below Memphis	30	55	13	124	228
198 Yazoo River	97	134	34	262	440
199 Big Black River	11	34	7	59	100
200 Mississippi River MS	37	58	5	148	234
201 Mississippi River Mouth	151	247	45	963	1,394
207 Ouachita River	87	129	98	567	850
208 Actchafalaya River	137	190	33	200	371
209 Lake Ponchartrain	136	205	38	198	542
Other	0	21	0	26	36
Region Total	1,518	2,390	540	4,518	7,583
09 Souris-Red-Rainy					
076 Rainy River	10	14	10	24	36
077 Upper Red River North	29	35	76	223	289
078 Lower Red River	13	17	37	126	169
079 Souris River	7	13	16	71	92
Region Total	59	79	139	444	586

TABLE C-14 (cont'd)

NEEDS AND GRANTS DATA BY SUBBASIN

(Dollars in millions, population in thousands)

USGS Hydro Region/ Subbasin	1984 Current Needs ($1984)	2000 Total Needs ($1984)	Total Grants Obligated Through 1984 ($Nominal)	1984 Population Served	Year 2000 Needs Met Population Served
10 Missouri					
098 Jefferson River	1	2	3	11	13
099 Madison River	0	0	0	2	2
100 MO River Headwater	14	15	24	128	183
101 Marias River	1	2	3	20	22
102 Mussel Shell River	1	1	0	5	5
103 Missouri River	1	1	5	10	10
104 Milk River	1	1	6	26	34
105 Poplar River	1	2	0	14	18
106 Yellowstone River Headwater	1	1	0	1	1
107 Upper Yellowstone River	12	21	24	101	172
108 Upper Bighorn River	3	5	13	37	66
109 Middle Bighorn River	6	8	4	26	38
110 Tongue River	0	1	12	17	33
111 Middle Yellowstone River	0	0	4	16	29
112 Upper Powder River	1	1	4	7	15
113 Lower Powder River	0	0	0	1	1
114 Lower Yellowstone River	2	2	1	18	22
115 Little Missouri River	0	1	1	5	11
116 Missouri River 04	2	13	16	123	179
117 Missouir River 05	2	3	3	33	37
118 Upper Cheyenne River	2	3	1	7	10
119 Belle Fourche River	12	21	13	45	83
120 Lower Cheyenne River	6	20	9	58	143
121 Oahe Reservoir	1	1	0	6	7
122 White River	3	5	0	27	32
123 Missouri River SD	5	8	3	30	43
124 Niobrare River	4	7	7	26	34
125 Upper James River	7	12	6	60	85
126 Lower James River	20	24	11	73	84
127 Missouri River	8	14	14	60	76
128 Big Sioux River	30	51	54	165	250
129 Lower Sioux River	152	230	140	786	1,042
130 North Platte River Headwater	1	3	9	18	34
131 Upper North Platte River	4	14	23	77	161
132 Middle North Platte River	4	12	19	99	136
133 Upper South Platte River	73	285	102	2,074	3,202
134 South Platte River	5	7	13	58	82
135 Loup River	7	14	2	47	71
136 Elkhorn River	5	9	9	102	147
137 Platte River	12	45	26	297	406
138 Missouri River	155	185	88	441	591
139 Republican River	6	11	6	71	93
140 Smokey Hill River	1	1	0	5	6
141 Lower Smokey Hill River	12	24	13	145	170
142 Big Blue River	13	19	24	121	159
143 Kansas River	93	206	83	487	814
144 Grand River	271	439	235	1,012	1,488
145 South Grand River	93	149	109	178	305
146 MO River at St. Louis	49	70	45	212	315
147 Missouri River	97	245	34	377	486
210 Canada Border	0	0	0	0	0
Other	0	0	0	1	0
Region Total	1,200	2,214	1,221	7,766	11,446
11 Arkansas-White-Red					
181 Black River	25	32	21	70	105
182 White River	123	235	51	216	474

TABLE C-14 (cont'd)

NEEDS AND GRANTS DATA BY SUBBASIN

(Dollars in millions, population in thousands)

USGS Hydro Region/ Subbasin	1984 Current Needs ($1984)	2000 Total Needs ($1984)	Total Grants Obligated Through 1984 ($Nominal)	1984 Population Served	Year 2000 Needs Met Population Served
184 Purgatorie River	0	1	0	10	13
185 Arkansas River CO	46	85	48	510	730
186 Arkansas River KS	144	274	74	625	833
187 Upper Cimarron River	10	13	9	44	67
188 Lower Cimarron River	11	51	13	204	359
189 Salt Fork	10	13	9	90	104
190 Verdigris River	31	53	31	146	221
191 Neosho River	102	137	72	346	478
192 Canadian River Headwater	2	2	4	20	24
193 Canadian River Texas	15	25	12	182	211
194 Upper North Canadian River	8	10	0	34	44
195 Lower Canadian River	128	241	121	1,014	1,253
196 Arkansas River	171	255	57	681	1,032
197 Arkansas River Mouth	101	192	67	438	960
202 Upper Red River	32	46	6	240	307
203 Washita River	22	36	20	97	145
204 Middle Red River	54	69	8	287	366
205 Lower Red River	102	141	65	336	515
206 Red River	94	171	36	402	677
Other	0	0	5	0	0
Region Total	1,231	2,082	729	5,992	8,918
12 Texas Gulf					
211 Petronila River	150	286	76	658	1,259
212 Nueces River	38	64	17	120	223
213 Quadalupe River	556	682	69	1,330	1,845
214 Upper Colorado River	31	54	26	333	468
215 Middle Colorado River	233	449	53	592	1,122
216 Lower Colorado River	32	65	14	120	230
217 Upper Brazos River	38	62	15	355	475
218 Middle Brazos River	65	102	38	404	550
219 Lower Brazos River	652	1,342	470	3,806	6,267
220 Upper Trinity River	346	755	227	3,138	4,715
221 Lower Trinity River	97	127	88	359	522
222 Neches River	117	187	34	246	498
223 Sabine River	92	144	41	307	519
Region Total	2,447	4,319	1,168	11,768	18,693
13 Rio Grande					
224 Rio Grande Headwater	15	22	14	61	102
225 Upper Rio Grande	79	173	59	569	985
226 Upper Pecos River	10	21	22	119	158
227 Lower Pecos River	15	20	4	56	72
228 Middle Rio Grande	56	83	26	473	630
229 Lower Rio Grande	43	88	15	256	472
230 San Luis Creek	0	0	0	3	3
231 Miscellaneous Region 13	3	2	0	37	48
Region Total	221	409	140	1,574	2,470
14 Upper Colorado					
232 Separation Creek	0	0	0	0	0
233 Gunnison River	7	25	22	30	88
234 Colorado River	2	27	62	113	348
235 Colorado River	2	5	0	12	18
236 Upper Green River	3	5	14	81	101

TABLE C-14 (cont'd)

NEEDS AND GRANTS DATA BY SUBBASIN

(Dollars in millions, population in thousands)

USGS Hydro Region/ Subbasin	1984 Current Needs ($1984)	2000 Total Needs ($1984)	Total Grants Obligated Through 1984 ($Nominal)	1984 Population Served	Year 2000 Needs Met Population Served
237 Yampa River	2	3	13	22	58
238 White River	0	1	1	4	13
239 Lower Green River	10	17	17	61	117
240 Upper San Juan River	8	25	17	66	169
241 Lower San Juan River	10	15	13	41	107
242 Little Colorado River	5	8	0	1	7
Region Total	49	131	159	431	1,026
15 Lower Colorado					
243 Lower Colorado River	45	87	10	139	307
244 Colorado River	18	64	18	549	973
245 Upper Gila River	13	16	6	42	69
246 Salt River	273	503	80	1,412	2,676
247 Lower Gila River	142	235	69	674	1,357
248 Colorado River CA	93	134	27	116	285
249 San Simon River	5	6	0	4	9
250 Whitewater Draw	4	5	3	19	27
Region Total	593	1,050	213	2,955	5,703
16 Great Basin					
251 Central Nevada	4	4	2	9	12
252 Truckee River	135	251	105	315	671
253 Quinn River	1	2	0	0	2
254 Humboldt River	7	9	10	26	43
255 Sevier River	25	36	3	31	92
256 Bear River	50	78	18	92	217
257 Weber River	272	540	107	1,148	1,885
258 Great Salt River	7	11	1	23	55
Region Total	501	931	246	1,644	2,977
17 Pacific Northwest					
259 Big Lost River	2	3	0	3	4
260 Silver Creek	0	0	0	0	0
261 Silvies River	0	0	0	9	12
262 Kootenai River	5	7	5	8	14
263 Upper Clark Fork	0	3	11	56	56
264 Lower Clark Fork	3	11	[illegible]	42	64
265 Flathead River	19	22	[illegible]	26	57
266 Pend Orielle	30	44	9	15	42
267 NE Puget Sound	323	432	123	228	561
268 Skyomish River	1,154	1,546	64	1,083	1,713
269 West Puget Sound	235	401	128	342	607
270 Washington Coast	66	96	81	65	126
271 Spokane River	346	428	75	241	530
272 Yakima River	7	55	41	167	252
273 Snake River WY	27	46	19	65	130
274 Big Wood River	4	18	2	11	22
275 Upper Snake River	15	32	30	139	247
276 Bruneau River	0	0	1	0	1
277 Lower Owyhee River	0	0	0	0	0
278 Owyhee River	0	0	0	0	0
279 Central Snake River	4	6	1	20	34
280 Lower Boise River	60	108	45	140	345

TABLE C-14 (cont'd)

NEEDS AND GRANTS DATA BY SUBBASIN

(Dollars in millions, population in thousands)

USGS Hydro Region/ Subbasin	1984 Current Needs ($1984)	2000 Total Needs ($1984)	Total Grants Obligated Through 1984 ($Nominal)	1984 Population Served	Year 2000 Needs Met Population Served
281 Malheur River	2	5	0	11	13
282 Payette River	9	14	7	25	40
283 Weiser River	1	1	0	2	3
284 Middle Snake River	1	5	6	16	22
285 Lower Salmon River	0	0	0	0	0
286 Upper Salmon River	3	6	1	5	12
287 Lower Snake River	5	8	7	20	35
288 Lower Clearwater River	4	7	0	9	12
289 Upper Clearwater River	9	16	7	33	51
290 Snake River	18	34	4	49	76
291 Umatilla River	4	7	9	24	49
292 John Day River	1	2	4	7	10
293 Lower Columbia River	72	126	46	174	345
294 Deschutes River	7	18	48	17	85
295 Cowlitz River	30	40	18	61	107
296 Columbia River Mouth	447	698	267	1,332	2,514
297 OR Northern Coast	20	32	26	35	77
298 Umpqua River	16	24	18	54	102
299 OR Southern Coast	8	12	8	39	63
300 Upper Rogue River	29	36	9	99	272
301 Lower Rogue River	1	2	3	12	22
Region Total	2,987	4,351	1,146	4,684	8,727
18 California					
302 Upper Klamath River	25	31	6	56	88
303 Lower Klamath River	37	45	60	99	121
304 Eel River	81	225	88	229	406
305 San Francisco Bay	735	1,094	845	3,792	4,539
306 Shasta Lake	16	23	7	23	43
307 Sacramento River	272	519	463	1,351	2,231
308 San Joaquin River	337	488	320	1,267	2,128
309 Salinas River	305	421	201	779	1,353
310 South CA Coast	1,293	2,452	1,053	13,194	16,683
311 Mojave River	199	317	48	341	877
312 Owens River	11	19	8	26	54
313 Eagle River	0	2	2	13	23
314 Kings River	213	369	106	911	1,560
Region Total	3,524	6,005	3,207	22,081	30,106
19 Alaska					
Region Total	160	343	146	268	631
20 Hawaii*					
Region Total	586	972	330	710	1,622
21 Puerto Rico**					
Region Total	1,639	2,248	346	1,671	3,636
GRAND TOTAL	61,832	85,705	37,170	169,371	246,451

* Includes American Samoa, Guam, Mariana Islands, and the Trust Territories

** Includes the Virgin Islands